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A WORKING KEY TO THE GENERA OF NORTH AMERICAN ALGAE

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LIST OF TUFTS COLLEGE STUDIES

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1. G. A. Arnold: The Anterior Cranial Nerves of *Pipa americana* (*Bulletin of the Essex Institute*, xxvi, pp. 1–9, 1893). 1 Plate and 1 Text-figure.
2. Julia B. Platt: Ectodermic Origin of the Cartilages of the Head (*Anatomischer Anzeiger*, viii, pp. 506–509, 1893).
3. J. S. Kingsley: The Classification of the Arthropoda (*American Naturalist*, xxviii, pp. 118 and 220, 1894).
4. O. L. Simmons: Development of the Lungs of Spiders (*American Journal of Science and Arts*, 1894). 1 Plate.
5. V. L. Leighton: The Development of the Wing of *Sterna Wilsonii* (*American Naturalist*, xxviii, p. 761, 1894).
6. F. C. Kenyon: The Morphology and Classification of the Pauropoda, with Notes on the Morphology of the Diplopoda. 4 Plates.
7. G. M. Winslow: The Chondrocranium in the Ichthyopsida. 4 Plates.
8. J. S. Kingsley: The Ossicula Auditus. 2 Plates.
9. A. B. Lamb: The Development of the Eye-Muscles in Acanthias (*American Journal of Anatomy*, i, pp. 185–202, 1902) 9 Text-figures.
10. J. S. Kingsley: The Cranial Nerves of Amphiuma. 3 Plates.
11. J. S. Kingsley: The Systematic Position of the Cæcilians. 1 Text-figure.
12. J. S. Kingsley: A description of *Cerianthus borealis*. Verrill. 7 Text-figures.
13. J. S. Kingsley and F. W. Thyng: The Hypophysis in Amblystoma. 11 Text-figures.
14. R. W. Richards: A New Habit for Chalcopyrite (*American Journal of Science and Arts*, 1904). 1 Text-figure.
15. F. F. Smith: Notes on a bicaudate specimen of *Limulus polyphemus*. 1 Text-figure.
16. G. M. Winslow: Three Cases of Abnormalities in Urodeles. 2 Plates.
17. George A. Bates: The Histology of the Digestive Tract of *Amblystoma Punctatum*. 3 Plates.
18. A. E. Preble: Catalogue of the Mammals in the Barnum Museum of Tufts College.

ERRATA

For "The Green Algae of North America," running title of Pages 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23 read, "Key to Genera of North American Algae."

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TUFTS COLLEGE STUDIES, Vol. IV, No. 8

A WORKING KEY TO THE GENERA OF NORTH AMERICAN ALGAE.

The following key is in no way a guide to technical classification and phylogeny; more elaborate works are needed for that purpose. It may however be of use to determine the genus of some particular plant, giving the clue to its affinities and rendering available the greater works. All well established genera are included for which authentic North American records could be found, the only omissions being the Diatomaceae, a study by themselves, and the dwellers of the threshold between botany and zoölogy, Peridiniaceae, Flagellatae and some others of similar character. As regards successful use of the key, it will probably require goodwill and patience, and different parts may present different difficulties.

In the Myxophyceae, the lowest class, making a key is comparatively easy; there are so few characters available for classification that the key follows them with hardly an exception. The chief difficulties here will be that though the distinctions are clear enough in our statement, it is not always easy to apply them to nature. For instance the four genera *Glococapsa*, *Glocothece*, *Aphanocapsa* and *Aphanothece* have what appear to be good lines of demarcation, but intermediate forms are found. Conditions seem to give temporarily to one species or genus some character of another, the normal character returning with return to normal conditions. Apart from this the Myxophyceae offer little difficulty; there is hardly an instance where fruiting plants are necessary for determining the genus.

In the Chlorophyceae somewhat more complex conditions prevail; not in all cases, for there is a great range in complexity between the unicellular simple forms, including unicellular forms assumed as stages of higher forms, and such sharply marked off genera as *Oedogonium* and *Coleochaete*. One is sure to find plenty of green algae whose position is indeterminable without continued culture and observation. In the great majority of cases, however, generic determination will not present much difficulty.

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Among the Phaeophyceae there are not many that either from temporary condition or as a normal stage of development assume uncertain or misleading characters; but most of the brown algae have specialized organs of fructification which are used as bases of classification, and sterile plants may present puzzles. *Pylaiella* and *Ectocarpus* are hardly to be distinguished by vegetative characters, certainly not by characters to be expressed with the conciseness of a key.

These conditions are even more noticeable in the Rhodophyceae; basal characters here used for classification are drawn from the sexual process that leads to the formation of the cystocarp; the characters of the mature cystocarp, on which was based the Agardhian classification, do not always indicate the first stages towards its production. As a consequence such studies are generally left to special investigators, and we accept the groupings resulting therefrom, trying to find less fundamental but more perceptible characters pertaining to the individual groups. By no means all types have yet been studied from this "procarpic" view; now and then a study of some hitherto unstudied type compels a readjustment, changing generic names that have stood for many years, separating plants closely similar to all appearance, and bringing together others apparently uncongenial. So that while in the blue-green algae this key follows practically the lines of technical classification, in the red algae these are totally unavailable, and more obvious characters must be used.

In generic limitations few changes will be found from those of Engler & Prantl, Die Natürlichen Pflanzenfamilien, as modified by the Nachträge, 1909-1911. In this work one will find full descriptions of all the genera both by the characters manifest and ascertainable, and by those esoteric and to be taken on trust; but the work is not usable as a key for the determination of an unknown plant, nor is it intended to be. If the student wishes to continue his work to the species, he will find for the blue-green algae the Sylloge Myxophycearum of Forti, issued as Vol. V of the Sylloge Algarum of De Toni, most valuable. For ordinary green algae the present author's work, the Green Algae of North America, with its two supplements, should sup-

ply the want. For brown and red algae, Vols. III and IV respectively of De Toni's Sylloge should be used. It must be kept in mind, however, that the books by Forti and De Toni claim no more than the name indicates, a sylloge in which are brought together descriptions of all published species, with the references; not a critical study. But it tells where the original description, the critical study and the monograph can be found, and in that way is simply invaluable. The issue of the Sylloge covered a period of nearly twenty years, during which many additions were made; except as these are summarized in Engler & Prantl's supplements, or as to the green algae by the present author, the student must hunt for himself. The notices of new publications in the Botanische Centralblatt and in Just's Botanischer Jahresbericht will be helpful. A great number of local lists and floras, more or less elaborate, are continually appearing, nearly always each with its bibliography of works consulted; from these one can get valuable indications. In cases of some quite recent changes, the older names are given as synonyms.

Really a key of this kind works chiefly in a negative way, by the process of excluding one after another the wrong names, and for that purpose any character, whether of taxonomic value or not, is useful. It is rather a novelty to introduce into a key of this kind factors of geographic distribution, but the experiment has now been made; the writer thinks that in quite a proportion of instances it may save time spent in sectioning and examining and work of that kind. The inquirer is more likely to know beforehand whether a specimen came from the Atlantic or the Pacific, from an arctic or a tropical region, than whether the tetraspores are cruciate or zonate. The geographic indication is of little value with Myxophyceae or with fresh water algae of other classes, and will not be used for them. In other cases the following abbreviations are used: P. for Pacific; A. for Atlantic, including in the latter the Gulf of Mexico, etc.; B. for Boreal. When a genus has a distinct northern or southern limitation, the forms An., As., Pn., Ps. are used, and need no explanation. No line of demarcation can be fixed; for instance *Hypnea*, As., overlaps *Laminaria*, An.; the indication is

general only. In some cases the species of a genus vary so much from each other that no one character or set of characters can be used; in such cases the same genus will be led up to in two or more places. To avoid possible assumption that the characters in one such reference belong to the whole genus, the abbreviation pp. "pro parte" is added, except when only a single species of the genus is represented; in such case the specific name is added.

To avoid the high numbers that would be required for one unbroken series, separate numberings have been used for the four classes, Myxophyceae, Chlorophyceae, Phaeophyceae and Rhodophyceae; as also for the two divergent groups of Green Algae, Characeae and Desmidiaceae. Any student using this key will probably be familiar with the principal characters of these classes and groups, so detailed characters of each are not given. In the vast majority of cases, the color is a sufficient guide as to class; special mention is made of the few genera in which the normal color of one class occurs with chromatophore, motile organs and reproduction of another class.

While every effort has been made to include all genera that should be included, it would be too much to expect absolute completeness; the number of additions to the North American flora has been so large for the past few years, that some one may have been overlooked. There is reason to suppose that additions will continue at least as frequently for years to come; for those who wish to keep their copy of the key up to date, the writer would suggest a plan that he has found useful in such cases; to have a copy interleaved, and whenever an additional genus is reported, insert the name on the blank page, opposite the place one is brought to in following the key, with a pair of lines indicating the difference from the nearest genus, the same as the pairs of lines in the key itself.

Finally, the key is not intended to indicate in any way the classification, affinities or phylogeny of algae; it merely gives you a name by which you can find in the proper place what is known, and sometimes what is not known about the plant; where it belongs in the system, and why it belongs there.

MYXOPHYCEAE.

NOTE. — Four genera have the blue-green color of the Myxophyceae, but from chromatophore, cilia, etc., are better placed among the Chlorophyceae. *Cryptoglena*, resembling *Chlamydomonas; Chroothece*, in gelatinous strata, cell with stellate chromatophore; *Glaucocystis*, resembling *Oocystis; Gloeochaete*, epiphytic, with long bristles. All four are unicellular.

1. Unicellular; cells often united loosely into families of various form but not into definite filaments, etc. 2.
1. Cells united into simple or branching filaments. 27.
2. Cells filiform, spirally twisted. SPIRULINA.
2. Cells not filiform. 3.
3. No reproduction other than by vegetative division of cells; no distinction of base and apex. 4.
3. Reproduction by non-motile spores formed by division of contents of a cell, as well as by vegetative division; cells or families showing distinction of base and apex. 22.
4. Cells solitary or united in small indefinite families without general membrane. 5.
4. Cells united in more definite families, with general membrane. 9.
5. Cells spherical. 6.
5. Cells not spherical. 7.
6. Membrane usually thick; cell division in three directions. CHROOCOCCUS.
6. Membrane thin; cell division transverse. SYNECHOCYSTIS.
7. Cells flattened, outline triangular. TETRAPEDIA.
7. Cells elongate. 8.
8. Cells slender, fusiform. DACTYLOCOCCOPSIS.
8. Cells ovoid or subcylindrical. SYNECHOCOCCUS.
9. Families without definite form. 10.
9. Families of definite form. 15.
10. Membrane of successive generations persistent, the older enclosing the younger as distinct stratification. 11.
10. Membrane diffluent; no stratification. 14.
11. Cells spherical. 12.
11. Cells elongate. GLOEOTHECE.
12. Stratum solid, formless; cells not in any order. GLOEOCAPSA.
12. Cells in more or less distinct order. 13.
13. Stratum encrusting; cells in vertical series. ENTOPHYSALIS.
13. Stratum hollow; cells in fours. PLACOMA.
14. Cells subspherical; division in three directions. APHANOCAPSA.
14. Cells elongate; division transverse. APHANOTHECE.

15. Free floating. 16.
15. Attached. 21.
16. Cells not forming a single superficial layer to the family. 17.
16. Cells forming a single layer. 20.
17. Families spherical or subspherical. 18.
17. Families cubical. EUCAPSIS.
18. Cells spherical or subspherical. 19.
18. Cells elongate, mostly obpyramidal. GOMPHOSPHAERIA.
19. Families clathrate. CLATHROCYSTIS.
19. Families not clathrate. MICROCYSTIS.
20. Family a hollow sphere. COELOSPHAERIUM.
20. Family a membrane-like expansion. MERISMOPEDIUM.
21. Family rounded or somewhat tubercular, cells in distinct radiating series. ONCOBYRSA.
21. Families flattened or encrusting; cells in indistinct series. CHLOROGLOEA.
22. Cells solitary or gregarious; no cell division except in formation of spores. DERMOCARPA.
22. Cells with vegetative division. 23.
23. Cells mostly gregarious, but not in definite families. XENOCOCCUS.
23. Cells united into definite families. 24.
24. Families subspherical or tubercular; cells in only indistinct arrangement. PLEUROCAPSA.
24. Cells distinctly seriate. 25.
25. Cells in short vertical series, laterally united into an extended encrusting stratum. RADAISIA.
25. Cells not forming an extended stratum. 26.
26. Cells in elongate branching series. HYELLA.
26. Cells in short unbranched series. CHAMAESIPHON.
27. No spores nor heterocysts. 28.
27. Heterocysts present. 40.
28. Terminal hairs present. AMPHITHRIX.
28. No terminal hairs. 29.
29. Filaments with no sheath, or exceptionally with a very evanescent one. 30.
29. Filaments with a definite sheath. 32.
30. Filaments regularly and uniformly spiral. ARTHROSPIRA.
30. Filaments not at all or only slightly and irregularly spiral. 31.
31. Filaments united in small, free bundles; marine. TRICHODESMIUM.
31. Filaments not united. OSCILLATORIA.
32. Filaments each in a single sheath. 33.
32. More than one filament in a sheath. 37.
33. Filaments pseudo-branched. PLECTONEMA.
33 Filaments unbranched. 34.
34. Sheaths mucous, diffluent, uniting the filaments into a submembranaceous stratum. PHORMIDIUM.

34. Sheaths not mucous nor diffluent. 35.
35. Sheath purplish. PORPHYROSIPHON.
35. Sheath colorless or yellowish. 36.
36. Tips of filaments uniting into erect pencillate tufts. SYMPLOCA.
36. Filaments loose or matted but not in erect tufts. LYNGBYA.
37. Filaments scattered and relatively few in a sheath. 38.
37. Many filaments forming a dense strand in the sheath. 39.
38. Sheath wide, mucous, colorless, diffluent and adherent. HYDROCOLEUM.
38. Sheath narrow, firm, colored or colorless, free. SCHIZOTHRIX.
39. Sheath firm, free. SIROCOLEUS.
39. Sheath mucous, adherent. MICROCOLEUS.
40. No terminal hairs present. 41.
40. Terminal hairs present. 58.
41. Filaments unbranched. 42.
41. Filaments with false or genuine branching. 49.
42. Sheaths none or inconspicuous and diffluent. 43.
42. Sheaths evident. 48.
43. Filaments free, or adherent but in no definite form. 44.
43. Filaments united in colonies of some definite form. 46.
44. Heterocysts terminal. CYLINDROSPERMUM.
44. Heterocysts intercalary. 45.
45. Cells discoid. NODULARIA.
45. Cells globose to cylindrical. ANABAENA.
46. Colony with firm epidermal layer. NOSTOC.
46. No firm epidermal layer. 47.
47. Colonies in form of minute, membranaceous scales. APHANIZOMENON.
47. Colonies tubular. WOLLEA.
48. Trichome single in sheath. MICROCHAETE.
48. Trichomes several in sheath. HORMOTHAMNION.
49. False branching only; filaments of a single series of cells. 50.
49. True branching; filaments often of several series of cells. 53.
50. Trichome single in sheath. 51.
50. Trichomes several in sheath. 52.
51. Branch arising below a heterocyst, usually single. TOLYPOTHRIX.
51. Branch arising between heterocysts; single or geminate. SCYTONEMA.
52. Trichomes irregularly curved and twisted in sheath. HYDROCORYNE.
52. Trichomes one or several in sheath, not curved; filaments in penicillate tufts. DESMONEMA.
53. Filaments free. 54.
53. Filaments united into a definite stratum. 57.
54. Filaments of a single series of cells. 55.

54. Filaments of more than one series of cells. 56.
55. Shell-boring algae; marine. MASTIGOCOLEUS.
55. Free, fresh water. HAPALOSIPHON.
56. Filaments of one or two series of cells, slender, branching unilateral. FISCHERELLA.
56. Filaments mostly of several series of cells; branching irregular. STIGONEMA.
57. Stratum small, pulvinate, firm. CAPSOSIRA.
57. Stratum expanded, rounded, soft. NOSTOCHOPSIS.
58. Filaments single or tufted, not in definite colonies. 59.
58. Filaments definitely united. 61.
59. Trichomes single in a sheath. CALOTHRIX.
59. Trichomes more than one in a sheath. 60.
60. Sheath including original trichome and branch. DICHOTHRIX.
60. Sheath including many trichomes and branches. POLYTHRIX.
61. Filaments flexuously curved and bent; heterocysts intercalary only. BRACHYTRICHIA.
61. Filaments normally straight; heterocysts basal and intercalary. 62.
62. Filaments erect, parallel, seldom branched, laterally united into a flat expansion. ISACTIS.
62. Filaments radiating, more or less branched. RIVULARIA (incl. GLOEOTRICHIA).

CHLOROPHYCEAE.

EXCEPT DESMIDIACEAE AND CHARACEAE.

1. Fresh water or aerial. 2.
1. Marine. 141.
2. Cells in ordinary condition with motile cilia. 3.
2. Cells without cilia, or ciliate only in reproduction. 15.
3. Cells solitary. 4.
3. Cells united in families or colonies. 7.
4. Cells fusiform. CHLOROGONIUM.
4. Cells spherical to ovoid. 5.
5. Protoplasmic threads passing through cell wall. HAEMATOCOCCUS, PP.
5. No such threads. 6.
6. Chromatophore grass-green. CHLAMYDOMONAS, PP.
6. Chromatophore blue-green. CRYPTOGLENA.
7. Colony without gelatinous envelope. SPONDYLOMORUM.
7. Colony with general gelatinous envelope. 8.
8. Cells without membrane, obconical, with wide longitudinal ribs. PYRAMIMONAS.
8. Cells with membrane. 9.

9. Cells arranged in a plate, with cilia on one side. GONIUM.
9. Otherwise. 10.
10. Cells conical, crowded, apices approximately near center of colony. PANDORINA.
10. Otherwise. 11.
11. Colony spherical, ellipsoidal or flattened, cells uniform in size. 12.
11. Colony spherical or spheroidal, or ellipsoid with small vegetative and large gonidial cells. 13.
12. Colony ellipsoidal or spherical, poles not differentiated. EUDORINA.
12. Colony flattened, horse-shoe shape, poles differentiated. PLATYDORINA.
13. Sexual reproduction by antheridia and oogonia; colonies usually of over 500 cells. VOLVOX.
13. No sexual reproduction known; colonies usually of less than 300 cells. 14.
14. Vegetative and gonidial cells in separate parts of the colony. PLEIODORINA.
14. Vegetative and gonidial cells intermingled. BESSEYOSPHAERA.
15. Cells solitary or temporarily and loosely adherent. 16.
15. Cells more or less permanently united. 53.
16. Endophytic. 17.
16. Not endophytic. 20.
17. Frond filiform. PHYLLOSIPHON.
17. Frond not filiform. 18.
18. Frond attached by stipe with basal disk; in gelatinous sheath of filamentous desmids. PERONIELLA.
18. Without stipe or disk. 19.
19. Green. CHLOROCHYTRIUM.
19. Red. RHODOCHYTRIUM.
20. Aerial. PROTOCOCCUS (Incl. PLEUROCOCCUS).
20. Aquatic or on wet ground. 21.
21. Endozoic. ZOOCHLORELLA.
21. Not endozoic. 22.
22. Attached by a stipe or rhizoids. 23.
22. Without organ of attachment. 26.
23. On wet ground, with subterranean rhizoids. 24.
23. Attached by a stipe or disk. 25.
24. Cell relatively large, rhizoids branched. BOTRYDIUM.
24. Cell smaller, rhizoids usually unbranched. PROTOSIPHON.
25. Chromatophore bell-shape, with one pyrenoid. CHARACIUM.
25. Chromatophores several, disk-shape; no pyrenoid. CHARACIOPSIS.
26. Filiform, branching. 27.
26. Otherwise. 28.
27. Branching lateral. VAUCHERIA, PP.
27. Branching dichotomous. DICHOTOMOSIPHON.

28. Cell spherical, covered with ridges or short spines. TROCHISCIA.
28. Otherwise. 29.
29. Cell a curved or coiled cylinder. OPHIOCYTIUM, PP.
29. Otherwise. 30.
30. Cell angular, often with projections. 31.
30. Cell rounded, cylindrical, or filiform. 33.
31. Cell with distinct central polyedral mass. TETRAEDRON.
31. Rays from common center without distinct central mass. 32.
32. Rays unbranched. CERASTERIAS.
32. Rays dichotomously divided. THAMNIASTRUM.
33. Cell with one or more projections. 34.
33. Cell without projections. 39.
34. Cell bearing a branching hair. DICRANOCHAETE.
34. Cell bearing spines or papillae. 35.
35. Cell wall with thick gelatinous coating. MICRACTINIUM.
35. No such gelatinous coating. 36.
36. Cell thin-walled with several spines. 37.
36. Cell thick-walled with rounded or conical papilla. CENTROSPHAERA.
37. Spines relatively thick in lower half, extremely slender in upper half. ACANTHOSPHAERA.
37. Spines of uniform diameter, or gradually tapering but without sharp distinction between upper and lower halves. 38.
38. Cell dividing longitudinally only. FRANCEIA.
38. Cell dividing in 3 directions. LAGERHEIMIA.
39. Cells spherical. 40.
39. Cells not spherical. 48.
40. Without pyrenoid. 41.
40. With pyrenoid. 43.
41. Wall thin. BOTRYDIOPSIS.
41. Wall thick, of 2 or more layers; chloroplast usually red. 42.
42. Wall of uniform thickness, chromatophores disk-shape. PALMELLOCOCCUS, PP.
42. Wall becoming thicker at one side, ultimately forming a stipe-like prolongation. UROCOCCUS.
43. Wall thin, homogeneous. 44.
43. Wall thick, protoplast usually red. 47.
44. Chromatophores numerous, disk-shape. 46.
44. Chromatophore single. 45.
45. Zoospores 4-8 in a cell. CHLOROSARCINA.
45. Zoospores many in a cell. CHLOROCOCCUM.
46. Chromatophores small, rounded. EREMOSPHAERA.
46. Chromatophores larger, angular. EXCENTROSPHAERA.
47. Living near surface of snow. CHLAMYDOMONAS, PP.
47. Living elsewhere. HAEMATOCOCCUS, PP.
48. Cell reniform. NEPHROCYTIUM.

48. Cell not reniform. 49.
49. Cell ovoid or broadly fusiform. OOCYSTIS, pp.
49. Cell more elongate. 50.
50. Cell fusiform or acicular. 51.
50. Cell cylindrical. STICHOCOCCUS, pp.
51. Cell dividing by 2 planes at right angles, daughter cells maintaining a definite order, enclosed loosely in gelatine. QUADRIGULA.
51. Cells dividing obliquely. 52.
52. Cells 4-8 μ diam., 225-530 μ long, many seriate pyrenoids. CLOSTERIOPSIS.
52. Cells proportionally shorter, one or more pyrenoids. ANKISTRODESMUS.
53. Cells in no definite order, united by common gelatine. 54.
53. Cells definitely arranged. 60.
54. Gelatine amorphous. 55.
54. Gelatine of definite form. 57.
55. Cells ovoid or short-fusiform. COCCOMYXA.
55. Cells spherical or subspherical. 56.
56. Broken pieces of cell wall persisting in gelatine. SCHIZOCHLAMYS.
56. Wall entirely dissolving in gelatine. PALMELLA.
57. Gelatine forming a membranaceous expansion or tube. TETRASPORA.
57. Gelatine not membranaceous nor tubular. 58.
58. Gelatinous sheath fusiform. FUSOLA.
58. Gelatine forming a branching filiform thallus. 59.
59. Cells large, distantly seriate. HORMOTILA.
59. Cells small, uniformly distributed. PALMODICTYON (incl. PALMODACTYLON), pp.
60. Cells included in general gelatine. 62.
60. Cells without general gelatine. 61.
61. Living in shells of mollusks. GOMONTIA, pp.
61. Not in shells. 82.
62. Gelatinous thallus filiform. 63.
62. Otherwise. 67.
63. Gelatinous thallus unbranched. 64.
63. Gelatinous thallus branched. 65.
64. Sheath transversely lamellate. GEMINELLA (HORMOSPORA).
64. Sheath not transversely lamellate. RADIOFILUM.
65. Cells at end of branches. MISCHOCOCCUS.
65. Cells throughout filaments. 66.
66. Cells fusiform. ELAKATOTHRIX.
66. Cells spherical, walls persisting after cell division. PALMODICTYON, pp.
67. Gelatinous thallus of indefinite form. 68.
67. Gelatinous thallus of definite form. 76.
68. Cell wall persistent after cell division. 70.

68. Cell wall not persistent. 69.
69. Cells in twos and fours, with bristles; chromatophore blue-green. GLOEOCHAETE.
69. No bristles; chromatophore grass-green. 71.
70. Cells spherical. GLOEOCYSTIS, PP.
70. Cells elongate. DACTYLOTHECE.
71. Cells crescent-shape. KIRCHNERIELLA.
71. Otherwise. 72.
72. Cells in one plane. 73.
72. Cells not in one plane. 75.
73. Cells without prominences. 74.
73. Cells with projections from the edges. TETRASTRUM.
74. Cells spherical, in groups of 4, groups collected without definite order into colonies. WESTELLA.
74. Cells of various form, usually flattened, never spherical; groups of 4 usually forming larger aggregates in one plane. CRUCIGENIA.
75. Cells cylindrical with rounded ends, 4-8 in a spherical colony; colonies united in large aggregates. GLOEOCYSTOPSIS.
75. Cells ovoid-conical to ellipsoid, in groups of many cells. BOTRYOCOCCUS (incl. INEFFIGIATA).
76. Cells united in branching, articulate filaments. 77.
76. Otherwise. 79.
77. Thallus a horizontal layer of densely packed, vertical filaments. 78.
77. Thallus spherical, tubercular, or branching. CHAETOPHORA.
78. Akinetes and zoospores in intercalary sporangia. CHLOROTYLIUM.
78. Akinetes and aplanospores terminal; zoospores unknown. WITTROCKIELLA.
79. Gelatinous thallus pyriform, attached. APIOCYSTIS.
79. Gelatinous thallus rounded, free. 80.
80. Colony of 2-8 regularly placed cells, usually surrounded by dark bands. GLOIOTAENIUM.
80. Otherwise. 81.
81. Chromatophore single, bell-shape. GLOIOCOCCUS.
81. Chromatophores several, discoid. CHLOROBOTRYS.
82. Daughter cells persistent in wall of mother cell; no other union. 83.
82. Cells otherwise united. 85.
83. Cells ovoid. 84.
83. Cells reniform. NEPHROCYTIUM.
84. Chromatophore blue-green. GLAUCOCYSTIS.
84. Chromatophore grass-green. OOCYSTIS, PP.
85. Cells elongate, stipitate, the stipe of one cell on the apex of another. OPHIOCYTIUM, PP.
85. Otherwise. 86.

86. Cells united to form a disk. 87.
86. Otherwise. 88.
87. Cells trapezoidal, 2 to a colony. EUASTROPSIS.
87. Cells of various form, many in a colony. PEDIASTRUM.
88. Cells elongate, united side to side. 89.
88. Otherwise. 90.
89. In one plane. SCENEDESMUS.
89. In two planes. TETRADESMUS.
90. Cells arranged symmetrically about a center. 91.
90. Otherwise. 98.
91. Cells lunate or sickle-shape. SELENASTRUM.
91. Cells not lunate nor sickle-shape. 92.
92. Colony in the form of a depressed sphere; cells in rings. PHYTOMORULA.
92. Otherwise. 93.
93. Cells attached by one end at center of colony, radiating in all directions. ACTINASTRUM.
93. Cells united ~~at center~~ by stipes. + stipe-absent, 94.
94. Stipes short, unbranched. = absent 95.
94. Stipes branched. 96.
95. Cells with spinous projections. SORASTRUM.
95. Cells without spinous projections. COELASTRUM.
96. Cells in series on gelatinous strands. DICTYOCYSTIS.
96. Cells at ends of strands. 97.
97. Cells spherical. DICTYOSPHAERIUM.
97. Cells reniform, ovoid or cordate. DIMORPHOCOCCUS.
98. Cells forming an expanded membrane, flat or tubular. 99.
98. Frond filamentous. 105.
99. Membrane attached to substratum by one surface. 100.
99. Attached only at base. 103.
100. Cells with hairs or bristles. 101.
100. Cells without hairs or bristles. 102.
101. Bristles with sheathed base. COLEOCHAETE.
101. Hairs without sheathed base. CHAETOPELTIS.
102. On pebbles, rarely on plants. PROTODERMA, PP.
102. On shells of turtles. ULVELLA (incl. DERMATOPHYTON).
103. Flat. 104.
103. Tubular. ENTEROMORPHA, PP.
104. Chromatophore stellate; no motile spores. PRASIOLA, PP.
104. Chromatophore discoid; motile spores produced. MONOSTROMA, PP.
105. Filaments forming a net. HYDRODICTYON.
105. Filaments not forming a net. 106.
106. Filaments of a single series of cells. 108.
106. Filaments partly of more than one series. 107.
107. Cells ultimately dividing to form a plane. SCHIZOGONIUM.

107. Cells ultimately forming a parenchymatous mass. SCHIZOMERIS.
108. Filaments unbranched. 109.
108. Filaments branched. 124.
109. Cells breaking to show H-section. 110.
109. Not showing H-section. 111.
110. Chromatophore single, parietal. MICROSPORA.
110. Chromatophores numerous, disk-shape. TRIBONEMA (CONFERVA).
111. Division of cell leaving rings about the filament, at upper end of cell. OEDOGONIUM.
111. No such rings. 112.
112. Protoplast ovoid, fusiform, dividing to form a pair of conical cells, base to base, with common lamellate wall. CYLINDROCAPSA.
112. Otherwise. 113.
113. Chromatophore net-shape, or breaking up into small disks. 114.
113. Otherwise. 115.
114. Chromatophores in zones; reproduction by oospores and antheridia. SPHAEROPLEA.
114. Otherwise. 116.
115. Chromatophore continuous, parietal. 117.
115. Otherwise. 119.
116. Regularly cylindrical, attached. CHAETOMORPHA, PP.
116. More or less irregular, not attached. RHIZOCLONIUM, PP.
117. Chromatophore a disk or plate. STICHOCOCCUS.
117. Chromatophore a zonate band. 118.
118. Apical and basal cells attenuate. URONEMA.
118. Apical and basal cells little attenuated. ULOTHRIX, PP.
119. Chromatophore an axillary plate. 120.
119. Otherwise. 121.
120. Spore ovoid with 3 longitudinal ridges and many fine cross lines. DEBARYA.
120. Spore lentiform or with outline more or less angled, smooth or scrobiculate. MOUGEOTIA.
121. Chromatophore one or more spiral bands. 122.
121. Otherwise. 123.
122. Vegetative cells conjugating directly. SPIROGYRA.
122. Short conjugating cells cut off from the long vegetative cells. TEMNOGYRA.*
123. Chromatophores 2 rounded, excentric disks. PLEURODISCUS.
123. Chromatophores 2, stellate. ZYGNEMA.
124. With hairs or setae. 125.
124. Without hairs or setae. 133.
125. Aerial. 126.
125. Aquatic. 127.

* I. F. Lewis, ms.

126. Filaments prostrate at base, but not forming a definite disk. NYLANDERA.
126. Definite basal disk of one or more layers. CEPHALEUROS.
127. More or less endophytic. 132.
127. Not endophytic. 128.
128. Setae sheathed at base. CHAETOSPHAERIDIUM.
128. No sheaths. 129.
129. Setae bulbous at base. 130.
129. Setae not bulbous. 131.
130. Frond prostrate. HERPOSTEIRON.
130. Frond erect. BULBOCHAETE.
131. Cells of main filaments of different appearance from those of the definitely outlined branch system. DRAPARNALDIA.
131. Axes of successive orders differing only in size. STIGEOCLONIUM (incl. ENDOCLONIUM).
132. In leaves. ENDODERMA, PP.
132. In gelatinous algae. CHAETONEMA.
133. Aerial or terrestrial. 134.
133. Aquatic. 135.
134. Reproduction by zoospores or zoogametes. TRENTEPOHLIA.
134. Reproduction by oogonia and antheridia; cell division as in Oedogonium. OEDOCLADIUM.
135. Branches few-celled, rhizoidal. RHIZOCLONIUM, PP.
135. Branches similar to axes. 136.
136. Endophytic partly or wholly. ENDODERMA, PP.
136. Not endophytic. 137.
137. Erect filaments densely packed, forming a definite stratum. 138.
137. Otherwise. 139.
138. Sporangia terminal. GONGROSIRA.
138. Sporangia intercalary. LEPTOSIRA.
139. Very minute; no cross wall at base of branch. MICROTHAMNION.
139. Larger; cross wall usually at base of branch. 140.
140. Reproduction by large cylindrical, conical or barrel-shape akinetes. PITHOPHORA.
140. Reproduction by minute zoospores or zoogametes. CLADOPHORA, PP.
141. Frond not formed by the union of cells. 142.
141. Frond formed by the union of cells. 167.
142. Frond a single cell of microscopic size. 143.
142. Frond larger, often of much differentiated form, but not divided into cells. 153.
143. With motile cilia. CRYPTOGLENA. A.
143. No cilia. 144.
144. Endophytic. 145.
144. Not endophytic. 146.
145. Cell ovoid, with rudimentary stipe. CODIOLUM PETROCELIDIS. AN.

145. Cell without stipe.
CHLOROCHYTRIUM (incl. CHLOROCYSTIS). AP.
146. Endozoic. CHLOROCOCCUM. AN.
146. Not endozoic. 147.
147. With setae. DIPLOCHAETE. AS.
147. Without setae. 148.
148. Cell attached by a stipe. CODIOLUM, PP. AN.
148. Cell without stipe. 149.
149. Cells not included in common gelatine. 150.
149. Cells included in common gelatine. 151.
150. Chromatophore disk-shape, wall uniform.
PALMELLOCOCCUS. AN.
150. Chromatophore bell-shape, wall ultimately much thickened on one side. UROCOCCUS. AN.
151. Gelatine amorphous; daughter cells included in persistent wall of mother cell. GLOEOCYSTIS. AP.
151. Gelatine in form of branching filaments. 152.
152. Filaments imbedded in general gelatine. COLLINSIELLA. P.
152. Filaments not imbedded in common gelatine.
PRASINOCLADUS. AN.
153. Frond differentiated into root, stem and branches.
CAULERPA. AS. PS.
153. Otherwise. 154.
154. Vesicular. HALICYSTIS. PN.
154. Otherwise. 155.
155. Filaments united or interwoven to form a frond of definite form. 156.
155. Otherwise. 163.
156. Not calcified; no distinct stipe. CODIUM. AS. P.
156. Calcified. 157.
157. Frond of seriate disks. HALIMEDA. AS.
157. Otherwise. 158.
158. Stipe terminating in a tuft of free filaments. PENICILLUS. AS.
158. Otherwise. 159.
159. Frond terminating in numerous flat expansions.
RHIPOCEPHALUS. AS.
159. Otherwise. 160.
160. Without definite cortical layer. 161.
160. Cortical layer on stipe or lamina. 162.
161. Filaments of frond with short lateral branchlets, each terminating in a 2-6-parted tenaculum. RHIPILIA. AS.
161. No such tenacula. AVRAINVILLEA. AS.
162. Cortex of divaricate, labyrinthiform branches always present.
CLADOCEPHALUS. AS.
162. Cortex of lamina wanting, or of short, little divided branches.
UDOTEA. AS.

163. In the interior of shells of mollusks. OSTREOBIUM. A.
163. Otherwise. 164.
164. Erect axis with branches of one or more orders, mostly plumose. BRYOPSIS. A. P.
164. Otherwise. 165.
165. Filaments frequently constricted, especially at base of a branch. DICHOTOMOSIPHON. AS.
165. Otherwise. 166.
166. Producing oogonia and antheridia; zoospores multinucleate, at ends of branches. VAUCHERIA, PP. A. P.
166. No sexual organs; zoospores uninucleate, in sporangia shut off from frond by a double wall. DERBESIA. A. P.
167. Forming a flat or tubular membrane. 168.
167. Otherwise. 174.
168. Tubular. 169.
168. Flat. 170.
169. Cells in groups of four, which form easily separable, longitudinal series. ILEA. AN.
169. Seriation less distinct or lacking; frond not splitting readily. ENTEROMORPHA, PP. A. P.
170. Attached by one surface. PROTODERMA, PP. AN.
170. Attached at base only. 171.
171. Membrane formed by laterally united filaments, in a regular radiate pattern. ANADYOMENE. AS.
171. Cells of membrane not showing filamentous origin. 172.
172. Membrane distromatic. ULVA. A. P.
172. Membrane monostromatic. 173.
173. Cells in more or less distinct series in two directions; chromatophore stellate; reproduction by akinetes. PRASIOLA, PP. AN. PN.
173. Cells not in series; chromatophore parietal; reproduction by motile spores. MONOSTROMA, PP. A. P.
174. Frond of relatively large, vesicular cells, attached to each other and to subtratum by minute cells. VALONIA. AS.
174. Otherwise. 175.
175. With more or less firm calcareous incrustation. 176.
175. No calcareous incrustation. 182.
176. Frond with slender stipe, bearing one or more cup-shape disks, formed by united whorled branches, containing spores. 177.
176. Otherwise. 179.
177. Spores imbedded in a solid mass of lime. ACICULARIA. AS.
177. Spores free. 178.
178. Spores not calcified. ACETABULARIA. AS.
178. Spore membrane calcified. CHALMASIA. AS.
179. Forming a disk, closely adherent by lower surface. PETROSIPHON. AS.
179. Erect. 180.

180. Annularly constricted stipe bearing at summit a dense mass of branching filaments. CHAMAEDORIS. AS.
180. Otherwise. 181.
181. Cylindric-clavate, unbranched. NEOMERIS. AS.
181. Moniliform, branched. CYMOPOLIA. AS.
182. Axis erect, unbranched, with frequent whorls of ramuli. 183.
182. Otherwise. 184.
183. Sporangia terminal. DASYCLADUS. AS.
183. Sporangia lateral. BATOPHORA. AS.
184. Frond a solid or hollow mass of small polygonal cells. DICTYOSPHAERIA. AS.
184. Distinctly filamentous, filaments either free or united in various ways. 185.
185. Living in the substance of shells of mollusks. GOMONTIA, PP. A. P.
185. Not shell boring. 186.
186. Filaments united laterally. 187.
186. Filaments not united laterally. 193.
187. Forming a regular disk. 188.
187. Forming an irregular, loose incrustation. PSEUDENDOCLONIUM. AN.
188. Disk monostromatic. 189.
188. Disk polystromatic. 191.
189. Setae or hairs more or less abundant. OCHLOCHAETE. A. P.
189. No setae nor hairs. 190.
190. Disk formed of filaments radiating from center. PRINGSHEIMIA. A.
190. Disk formed of irregular filaments. EPICLADIA. A.
191. Setae or hairs present. 192.
191. No setae nor hairs. ULVELLA. A.
192. Setae articulate. ARTHROCHAETE. B.
192. Setae not articulate. CHAETOBOLUS. B.
193. Horizontal layer producing erect filaments with terminal or lateral sporangia. PILINIA. A.
193. Otherwise. 194.
194. Filaments unbranched. 195.
194. Filaments branched. 201.
195. Filaments of a single series of cells. 196.
195. Filaments in part of several series, not all in one plane. GAYELLA. P.
196. Chromatophore a zonate band or parietal disk. 197.
196. Chromatophore covering cell wall, continuous or net-shape. 198.
197. Filaments 6 μ diam. or more; chromatophore zonate. ULOTHRIX, PP. A. P.
197. Filaments 6 μ diam. or less; chromatophore a parietal disk. STICHOCOCCUS, PP. AN.

198. Filaments soft, flaccid. 199.
198. Filaments firm, stiff. 200.
199. Cells discoid, in wide, hyaline, gelatinous filaments. GEMINELLA (HORMOSPORA). AS.
199. Wall soft, but not thick nor gelatinous. HORMISCIA. A. P.
200. Filament regularly cylindrical. CHAETOMORPHA, PP. A. P.
200. Filament more or less irregular. RHIZOCLONIUM, PP. A. P.
201. Endozoic or endophytic, exceptionally epiphytic. 202.
201. Otherwise. 209.
202. In outer coating of shells of mollusks. TELLAMIA. AN.
202. Endo- or epiphytic. 203.
203. In cell wall of algae or among cells of Zostera. ENDODERMA, PP. A. P.
203. Endophytic in tissue of algae; exceptionally partly epiphytic. 204.
204. Setae or hairs present. 205.
204. No setae nor hairs. 208.
205. Hairs spiral. PHAEOPHILA. AS.
205. Hairs or setae straight. 206.
206. Setae arising from small special cells. BOLBOCOLEON. AN.
206. Setae arising from cells of filament. 207.
207. Setae arising from back of horizontal cells. BLASTOPHYSA. AS.
207. Setae arising from ends of upright cells. ACROCHAETE. AN.
208. Frond a basal network with short upright branches. PSEUDODICTYON. P.
208. Branching irregular; no definite network. ENDOPHYTON. P.
209. Branches rhizoidal. RHIZOCLONIUM, PP. A.P.
209. Branches similar to axis. 210.
210. Branches without partition at base. 211.
210. Branches with partition at base. 212.
211. Frond originating in a single erect clavate cell, which may or may not remain clearly distinguishable in the mature plant. SIPHONOCLADUS. AS.
211. No main axis. CLADOPHOROPSIS. AS.
212. Branches whorled, unicellular. ERNODESMIS. AS.
212. Branches not whorled. 213.
213. Branches adhering to each other by tips. 214.
213. Branches free. 217.
214. Branching in all directions. BOODLEA. AS.
214. Branching in one plane. 215.
215. With cylindrical stipe. STRUVEA. AS.
215. Without stipe. 216.
216. Small secondary cells partly filling interstices; openings rounded. CYSTODICTYON. AS.
216. No secondary cells; openings angular. MICRODICTYON. AS.
217. Specialized hooked or rhizoidal branches present; cell division largely intercalary. SPONGOMORPHA. A. P.

217. No such branches; cell division chiefly terminal.
CLADOPHORA, PP. A. P.

DESMIDIACEAE.

NOTE. — In this list and in the following, Characeae, a few genera are included, in all probability occuring in North America, but not yet authentically recorded.

1. Cells solitary, separating after division. 2.
1. Cells continuing united. 20.
2. No constriction or only a very slight one between two semicells. 3.
2. Semicells separated by a distinct constriction. 10.
3. Cell straight. 4.
3. Cell more or less distinctly crescent or bow shape. 9.
4. Chromatophore parietal, spiral. SPIROTAENIA.
4. Chromatophore not spiral. 5.
5. Chromatophore a single plate in each cell. MESOTAENIUM.
5. One or more chromatophores in each semicell. 6.
6. Chromatophore stellate. CYLINDROCYSTIS.
6. Chromatophore axial, with longitudinal radiating plates. 7.
7. Two chromatophores in each semicell. NETRIUM, PP.
7. One chromatophore in each semicell. 8.
8. Plates of the chromatophore with entire edges. PENIUM.
8. Plates of the chromatophore with notched edges. NETRIUM, PP.
9. Curvature slight; chromatophore with convex tip, quite filling cell. ROYA.
9. Curvature slight or marked; chromatophore with concavity at tip, leaving space for apical vacuole. CLOSTERIUM.
10. Semicells several times as long as broad; median constriction slight. 11.
10. Semicells not much longer than broad; median constriction usually marked. 15.
11. Semicell with a notch at apex. 12.
11. Semicell without notch at apex. 14.
12. Cell wall with rings of furcate processes. TRIPLOCERAS.
12. Cell wall smooth. 13.
13. Apical notch wide, apical angles with spines. ICHTHYOCERCUS.
13. Apical notch narrow, apical angles rounded. TETMEMORUS.
14. Bases of semicells plicate. DOCIDIUM.
14. Bases of semicells not plicate. PLEUROTAENIUM.
15. Cells in vertical view 3 or more angled or with radiate projections; rarely fusiform. STAURASTRUM.
15. Cells in vertical view oval to fusiform, elongate at right angles to line of front view. 16.

16. Cells with spines. 17.
16. Cells without spines. 18.
17. Semicell with central protuberance. XANTHIDIUM.
17. No central protuberance. ARTHRODESMUS.
18. Semicell without deep incision. COSMARIUM.
18. Semicell with distinct, often quite deep incision. 19.
19. Semicells more or less lobed and incised, of various outline, usually with one or more hemispherical prominences near base. EUASTRUM.
19. Cells strongly compressed, of circular or oval outline, semicells usually deeply and sharply loped and incised, usually without conspicuous prominences. MICRASTERIAS, PP.
20. Cells united by branching gelatinous bands, not in simple filaments. 21.
20. Cells united into simple filaments. 22.
21. Bands slender, colonies loose. COSMOCLADIUM.
21. Bands stout, colonies compact. OOCARDIUM.
22. Protoplasm colored purple. ANCYCLONEMA.
22. Protoplasm not colored purple. 23.
23. Cells cylindrical, length many times the diam.; outer wall with spines or roughness. 24.
23. Cells of various form, not long cylindrical. 25.
24. Chromatophore axial. GONATOZYGON.
24. Chromatophore parietal, spirally twisted. GENICULARIA.
25. Cells united by apical processes. 26.
25. Cells united directly, without processes. 29.
26. Cells squarish in front view, much compressed, united in ribbon-like series. MICRASTERIAS FOLIACEA.
26. Cells not much compressed nor squared in front view. 27.
27. Apical processes short, meeting similar processes from next cell. SPHAEROZOSMA.
27. Apical processes longer. 28.
28. Each semicell with two processes, overlapping on next cell, but not meeting processes of the latter. ONYCHONEMA.
28. Each cell united to the next cell by 3 cylindrical processes. STREPTONEMA.
29. Median constriction slight. 30.
29. Median constriction marked. 31.
30. Filaments surrounded by a wide gelatinous sheath. HYALOTHECA.
30. Filaments without gelatinous sheath. DESMIDIUM, PP.
31. Cells round or elliptical in vertical view. 32.
31. Cells angular or with radiate arms in vertical view. 33.
32. Cells elliptical in vertical view. SPONDYLOSIUM.
32. Cells circular with 2 small opposite prominences in vertical view. GYMNOZYGA.

33. Cells angular in vertical view, semicells symmetrical.
DESMIDIUM, PP.

33. Cells quadrate with prolonged angles, prolongations laterally asymmetrical in vertical view; semicells asymmetrical in front view.
PHYMATODOCIS.

CHARACEAE.

1. Sporangium with coronula of 5 unicellular rays. 2.
1. Sporangium with coronula of 5 bicellular rays. 5.
2. Dioecious; no stipular ring to whorls of leaves. TOLYPELLOPSIS.
2. Stipular ring present. 3.
3. Dioecious. CHARA, PP.
3. Monoecious. 4.
4. Sporangium below the antheridium. LAMPROTHAMNUS.
4. Sporangium laterally between antheridia. LYNCHNOTHAMNUS.
4. Sporangium above the antheridium. CHARA, PP.
5. Antheridium terminal on a leaf, or on a leaflet not of the last order.
NITELLA.
5. Antheridium on a unicellular lateral leaflet. TOLYPELLA.

PHAEOPHYCEAE

1. Unicellular, minute. PHAEOCOCCUS. AN.
1. Pluricellular. 2.
2. Filamentous, articulate at least in younger parts. 3.
2. Not manifestly filamentous and articulate. 28.
3. Free filaments arising from a stratum of different character, constituting an important part of the vegetative plant. 4.
3. Lower stratum wanting, or chiefly an organ of attachment. 14.
4. Lower stratum densely branched or subparenchymatous, not membranaceous. 5.
4. Lower stratum of horizontal filaments more or less completely united into a membrane. 7.
5. Free filaments not monisiphonous. GIRAUDIA. AN.
5. Free filaments monosiphonous. 6.
6. Sporangia at base of free filaments. ELACHISTA. A. P.
6. Sporangia intercalary in filaments. LEPTONEMA. AN.
7. Thick walled, saccate paraphyses present. ASCOCYCLUS. A. P.
7. No such paraphyses. 8.
8. Prostrate frond growing in the external membrane of Laminaria.
DERMATOCELIS. B.
8. Prostrate frond endo- or epiphytic, but not in membrane. 9.
9. Sporangia seriate. 10.
9. Sporangia not seriate. 11.
10. Erect filaments branched. MICROSPONGIUM. AN.
10. Erect filaments not branched. HAPLOSPONGIDIUM. P.

11. Plurilocular sporangia, dense masses of squarish cells, occupying the central part of frond; erect filaments few.
PHAEOSTROMA. AN.

11. Plurilocular sporangia scattered among erect filaments, not in masses. 12.

12. Erect filaments and sporangia normally arising from any and all cells of basal layer. MYRIONEMA. A. P.

12. Erect filaments and sporangia normally arising from only part of basal layer. 13.

13. Erect filaments, etc., normally arising only from central part of basal layer. HECATONEMA. A.

13. Erect filaments, etc., normally arising in dense groups of irregular form, separated by vacant spaces. CHILIONEMA. A.

14. Lower part of frond endophytic. 15.

14. Not endophytic. 17.

15. Erect filaments of limited growth and in dense tufts.
STREPSITHALIA. PS.

15. Erect filaments short but not limited, scattered. 16.

16. Fructification on endophytic portion. STREBLONEMA. A. P.

16. Round unilocular sporangia on basal filaments; plurilocular sporangia on erect filaments. MYRIOTRICHIA FILIFORMIS. AS.

17. Cells normally or often divided by longitudinal walls. 18.

17. Cells normally not divided longitudinally. 19.

18. Frond minute, a few mm. high, longitudinal division of cells incidental and irregular; pl. sp. lateral, cylindric fusiform.
RHADINOCLADIA. AN.

18. Fronds usually larger, longitudinal division of cells regular and normal; pl. sp. chiefly ovoid; propagula more common.
SPHACELARIA. A. P.

19. Unil. sp. intercalary. PYLAIELLA. A. P.

19. Unil. sp. terminal, lateral or unknown. 20.

20. Unil. sp. terminal or unknown. 21.

20. Unil. sp. lateral. 25.

21. Pl. sp. arising from division of an intercalary cell. 22.

21. Pl. sp. arising from division of a terminal cell. 24.

22. Pl. sp. short horizontal filaments densely packed in place of the mother cell; unil. sp. unknown. HALOTHRIX. AN.

22. Pl. and unil. sp. formed from intercalary cells; fronds often in part inarticulate and subparenchymatous. 23.

23. Pl. sp. of two kinds, one resembling Pylaiella, the other as projecting sori; unil. sp. unknown. KJELLMANNIA. AN.

23. Frond articulate only in younger parts; unil. and pl. sp. formed from single scattered cells. STICTYOSIPHON, PP. A. P.

24. Pl. sp. terminal or taking the place of a vegetative branch.
ECTOCARPUS. A. P.

24. Pl. sp. rounded, in dense clusters. SOROCARPUS. AN.

25. Unil. sp. in twos, opposite on a veg. cell, producing motile spores. ISTHMOPLEA. AN.
25. Unil. sp. producing motionless spores. 26.
26. Fructification by motionless monospores, relatively large, and antheridia; (oospores?) HAPLOSPORA. AN.
26. Monospores relatively small, in pedicelled sporangia, often grouped; also ciliate zoospores in spherical sporangia. HETEROSPORA. AS.
27. Frond of short, densely forked, radiating, procumbent branches, canaliculate below. HAPTEROPHYCUS. P.
27. Not as above. 28.
28. Frond terete or slightly compressed. 29.
28. Frond flat or strongly flattened, or saccate, or tubercular. 55.
29. Frond unbranched. 30.
29. Frond branched. 35.
30. Frond tubular. 31.
30. Frond solid. LITOSIPHON. AN.
31. Delicate, wall monostromatic. PHAEOSACCION. AN.
31. Stouter and coaser; wall pleiostromatic. 32.
32. Frond with internal diaphragms, but no external constrictions. CHORDA. A. P.
32. No internal diaphragms. 33.
33. Mature frond with frequent constrictions; pl. sp. compacted, forming a continuous coating. SCYTOSIPHON. A. P.
33. Not constricted. 34.
34. Sporangia free, with unicellular paraphyses. DELAMAREA. AN.
34. Sporangia in small prominent sori with pluricellular paraphyses. ASPEROCOCCUS. A. P.
35. Frond composed of branching articulate filaments, united by common gelatine into a terete frond. 36.
35. Not entirely composed of articulate filaments. 40.
36. Frond little branched; cortical layer of short, closely packed filaments enclosing the pyriform unil. sp.; pl. sp. unknown. GOBIA. AN.
36. Frond freely branched; cortical layer of long, loose filaments bearing unil. and pl. sp. 37.
37. Cortical filaments free, little gelatinous; frond beset throughout with abundant, long, little branched, articulate hairs. MYRIOCLADIA. AN.
37. Whole frond gelatinous; hairs less conspicuous or absent. 38.
38. Axillary layer of closely packed adherent filaments. 39.
38. Axillary layer of loose, more or less free filaments; cortical filaments ending in large, subspherical cells. MESOGLOIA. A. P.
39. Unil. sp. near base of cortical filaments; pl. sp. filiform, seriate on outer side of upper part of cortical filaments; soft and gelatinous. CASTAGNEA. A. P.

39. Unil. sp. at base of cortical filaments; pl. sp. from lower cells of same or wanting; firm and cartilaginous. CHORDARIA. A. P.

40. Frond more or less distinctly annulate, of a few series of squarish cells, growth by a large hemispherical terminal cell. DICTYERPA. AS.

40. Frond not annulate. 41.

41. Main axis densely beset with short, limited branches. 42.

41. Differentiation not so sharp. 45.

42. Main axis unbranched, limited branches short near its base, longer above. MYRIOTRICHIA. AN.

42. Main axis branched. 43.

43. Main axis with distichous limited branches. CHAETOPTERIS. AN. PN.

43. Branching not distichous. 44.

44. Branches dense and irregular; fructification in a dense cluster in axil of a branch. HALOPTERIS. AN.

44. Main axis producing dense whorls of short limited branches and pedicelled sporangia. CLADOSTEPHUS. AN. PN.

45. Interior of frond of relatively large, roundish-angular cells. 46.

45. Not of such cells. 52.

46. Youngest growth showing more or less distinct articulation, which disappears in more mature part. STICTYOSIPHON, PP. A. P.

46. Inarticulate throughout. 47.

47. Fronds slender, compressed above, branching dichotomous, fruit in superficial sori. CHNOOSPORA. P.

47. Branching not dichotomous. 48.

48. Fronds mostly hollow. 50.

48. Fronds mostly solid; pl. sp. unknown. 49.

49. Central layer of large cells; cortical layer of small densely packed cells; unil. sp. external to the cortical layer, among densely packed, unbranched paraphyses. MYELOPHYCUS. P.

49. Less distinction between central and cortical layers; unil. sp. immersed or slightly projecting. DICTYOSIPHON. A. P.

50. Pl. sp. short-cylindrical, in dense sori on surface of frond; unil. sp. unknown; branching irregular. 51.

50. Pl. sp. ovoid, scattered or in irregular sori; unil. sp. ovoid, forming rings about the frond; branching mostly opposite or whorled. STRIARIA. A.

51. Growth intercalary. ROSENVINGIA. AS.

51. Growth trichothallic. COELOCLADIA. B.

52. Fertile fronds thickly set with papilla-like tufts of mingled sporangia, paraphyses and hairs; branching irregular. STILOPHORA. A.

52. Fruit not in papillae; branching irregularly opposite or alternate; tufts of delicate hairs on younger growth. 53.

53. Sporangia immersed, little differentiated from veg. cells. DESMARESTIA. A. P.
53. Sporangia external. 54.
54. Limited branches in whorls; a limited branch may develop into a series of small unil. sp. ARTHROCLADIA. A.
54. Limited branch clavate, ending in a tuft of hairs; pyriform or obovoid unil. sp. formed around the clavate limited branch. SPOROCHNUS. AS. PS.
55. Frond horizontally expanded, attached by the under surface. 56.
55. Frond not horizontally expanded. 60.
56. Frond of several layers of squarish cells. AGLAOZONIA. AS.
56. Frond of articulate filaments. 57.
57. Unil. sp. terminal on the erect filaments. 58.
57. Unil. sp. lateral on the erect filaments. RALFSIA. A. P.
58. Fructification continuous. 59.
58. Fructification in distinct sori. SORAPION. AN.
59. Epiphytic; chromatophore single in a cell. SYMPHYOCARPUS. AN.
59. Saxicolous; chromatophores several in a cell. LITHODERMA. AN.
60. Frond saccate, mostly epiphytic; pl. sp. unknown. 61.
60. Frond not saccate. 62.
61. Unil. sp. immersed or slightly projecting. COILODESME. P.
61. Unil. sp. clavate, forming with clavate paraphyses distinct papilliform sori. SORANTHERA. PN.
62. Forming irregular vesicular or tubercular expansions, later sometimes perforate. 63.
62. Not vesicular nor tubercular. 66.
63. At maturity an open network. HYDROCLATHRUS. AS. PS.
63. Irregularly perforate at a late stage or not at all. 64.
64. Frond of roundish cells; pl. sp. cylindrical, forming with unicellular paraphyses small superficial sori. COLPOMENIA. AS. PS.
64. Frond in whole or part of articulated filaments. 65.
65. Cortical filaments attennate to each end; unil. sp. cylindrical or slightly clavate. CYLINDROCARPUS. P.
65. Cortical filaments short-clavate, unil. sp. ovoid or pyriform. LEATHESIA. A. P.
66. Frond compressed below, flat and narrowly linear above, branched, the conical fertile branches terminal. CARPOMITRA. PN.
66. Fronds flat in whole or in part, fruit not on conical branches. 67.
67. Fronds distinctly membranaceous, relatively thin, not massive nor of great size. 68.
67. Fronds usually of large size and massive structure, often with considerable differentiation of tissue. 80.
68. Frond of one to several layers of squarish cells. 69.
68. Frond not consisting of squarish cells. 78.
69. Tetraspores, undivided spores and antheridia external on the frond. 70.

69. Unil. and pl. sp. from superficial cells, immersed or projecting. 76.
70. With midrib. DICTYOPTERIS. AS. PS.
70. Without midrib. 71.
71. Fronds showing zonate lines of growth. 72.
71. No zonate lines of growth. 74.
72. Growing margin involute; zones of hairs concentric with zones of fructification; frond usually lightly calcified. PADINA. AS. PS.
72. Margin not involute; little or no calcification. 73.
73. Fructification normally on one side only of frond; felted fibres from lower part of frond assisting in attachment. ZONARIA. AS. PS.
73. Fructification normally on both sides of frond; little or no felted fibrous growth. TAONIA. PS.
74. Frond of more than two layers of cells. SPATOGLOSSUM. AS.
74. Frond of not more than two layers of cells. 75.
75. Frond of a single layer of cells. DICTYOTA. AS. PS.
75. Frond of two layers of cells, throughout or at margins. DILOPHUS. AS. PS.
76. Frond umbilicate or infundibuliform. OMPHALOPHYLLUM. B.
76. Frond not as above. 77.
77. Frond with scattered hairs; pl. sp. often prominent; frond quite narrow. DESMOTRICHUM. AN. PN.
77. Frond with tufted hairs arising from depressions; pl. and unil. sp. immersed; frond wider and larger. PUNCTARIA. AN. PN.
78. Interior of loosely interwoven articulate branching filaments. ENDARACHNE. P.
78. Interior of roundish or elongate cells, not filamentous. 79.
79. Pl. sp. cylindrical, closely packed laterally in continuous sori; unil. sp. unknown. PETALONIA (PHYLLITIS). A. P.
79. Pyriform or obovoid unil. sp. and hairs in scattered sori, paraphyses wanting; unil. sp. unknown. HALORHIPIS. P.
80. Unil. sp. in superficial sori; any other fructification occuring in embryonal stage only. 81.
80. Oogonia and antheridia in sunken conceptacles, formed on specialized portions of the frond; no asexual fructification. 98.
81. Stipe unbranched, usually persistent, sometimes vanishing; blade plane, entire, split or perforate. 82.
81. Stipe branched. 90.
82. Not producing sporophylls. 83.
82. Producing sporophylls. 89.
83. Holdfast not branched; blade not split nor perforate; paraphyses without hyaline appendages; cryptostomata present. PHYLLARIA. AN.
83. Holdfast branched or discoid; paraphyses with hyaline appendages; no cryptostomata. 84.
84. Stipe short, the base of the blade emitting haptera, and attaching, the stipe disappearing. HEDOPHYLLUM. PN.

84. Stipe long or short, persistent, the blade not rooting. 85.
85. Blade with frequent and regular perforations. AGARUM. AN. PN.
85. Blade imperforate, rarely with a few indefinite perforations. 86.
86. Blade without longitudinal ribs or folds. LAMINARIA. A. P.
86. Blade with longitudinal ribs or folds. 87.
87. Blade with a broad, shallow meridional fold. PLEUROPHYCUS. PN.
87. Blade with several ribs or folds. 88.
88. Three longitudinal folds on one side of the blade. CYMATHERE. PN.
88. Ribs alternating on the two sides; bullations between, becoming perforate. COSTARIA. P.
89. Sporophylls of limited growth; blade with distinct midrib. ALARIA. AN. PN.
89. Sporophylls of unlimited growth; no distinct midrib. PTERYGOPHORA. P.
90. Blade soon dividing into secondary fan-shaped perforate blades. THALASSIOPHYLLUM. PN.
90. Blade imperforate. 91.
91. No definite sporophylls. 92.
91. Definite sporophylls present. 96.
92. Branching dichotomous practically throughout. 93.
92. Branching soon unilateral and sympodial. 95.
93. Stipe flattened, prostrate, rooting. DICTYONEURON. P.
93. Stipe hollow in part, with branches and leaves at the summit. 94.
94. Hollow stipe cylindrical, of uniform diameter. POSTELSIA. P.
94. Stipe solid below, hollow above, terminating in a large hollow bulb, with constriction at base, bearing short, dichotomous branches ending in narrow leaves. NEREOCYSTIS. P.
95. Stipe solid, slender, blades with bladders in their bases. MACROCYSTIS. P.
95. Stipe solid below, hollow above, terminating in a large hollow bulb, with constriction at base, from which arise two branches, dividing at first, dichotomously, soon sympodially. PELAGOPHYCUS. PS.
96. Stipe short, apparent forking due to the decay of central base of blade and persistence of thickened margins; sporophylls on divisions of blade. EISENIA. PS.
96. Stipe long, many times branched. 97.
97. Blade splitting into long narrow divisions, with broader falcate sporophylls. LESSONIOPSIS. P.
97. Stipe flattened, bearing small blades, often with basal bladders, and small sporophylls. EGREGIA. P.
98. No distinct limited growth of any kind. 99.
98. Distinct limited growth of some sort present. 102.
99. No midrib; oogonium dividing to form two oospores. 100.
99. Midrib present. 101.

100. Oospores equal. PELVETIA. P.
100. Oospores very unequal. PELVETIOPSIS. P.
101. Oogonium dividing to form eight oospores. FUCUS. A. P.
101. Oogonium dividing to form two unequal oospores. HESPEROPHYCUS. P.
102. Only limited branches short lateral growths, mostly later developing receptacles; other branching chiefly dichotomous. ASCOPHYLLUM. A.
102. Branching monopodial. 103.
103. Receptacles appearing axillary to specialized limited branches. 107.
103. Receptacles not appearing axillary. 104.
104. Vesicles present as distinct organs. 106.
104. Swellings present in branches, but not as distinct organs. 105.
105. Swellings limited to the ultimate branches. CYSTOPHYLLUM. P.
105. Swellings not so limited. CYSTOSEIRA. AS. P.
106. Vesicles with septate interior; branching distichous. HALIDRYS. P.
106. Vesicles with continuous interior; branching radial. CYSTOPHORA. P.
107. The obconical limited branches often vesicular below. TURBINARIA. AS.
107. Limited branches foliaceous; vesicles spherical or elongate, solitary. SARGASSUM. AS. PS.

RHODOPHYCEAE.

NOTE. A certain number of Myxophyceae and Chlorophyceae have a red color, but the pigment is different from that of the Rhodophyceae, and seldom misleads an experienced student. It is impossible, however, to give any satisfactory account of this color shade matter in a key. The only genus of Rhodophyceae with cells not in fronds of definite form is *Porphyridium*, so the Myxophyceous red species of *Gloeocapsa*, *Dermocarpa*, *Radaisia*, and the Chlorophyceous *Haematococcus*, *Protosiphon* and *Palmellococcus* should give no trouble. Red forms occur in the filamentous Myxophyceae, *Spirulina*, *Oscillatoria*, *Porphyrosiphon*, *Phormidium* and *Schizothrix*, but the character of the filament is quite unlike anything in the Rhodophyceae. *Rhodochytrium* of the Chlorophyceae is a leaf parasite; the orange red of *Sphaeroplea*, the orange or rarely violet of *Trentepohlia* are not at all Rhodophyceous. The student will

soon be able to distinguish them from the few lower forms of the Rhodophyceae, to which only there is a slight resemblance. On the other hand, *Asterocytis* and *Goniotrichum*, among the lowest of the Rhodophyceae, assume under unfavorable conditions a Myxophyceous color.

RHODOPHYCEAE.

1. Cells free, or united by structureless gelatine. On earth, etc. PORPHYRIDIUM.
1. Cells united into fronds of definite form. 2.
2. Minute parasites, each usually limited to one host. 3.
2. Not parasitic. 10.
3. Leaf-like growth on Nitophyllum. GONIMOPHYLLUM. P.
3. Not leaf-like. 4.
4. Forming tubercular subdigitate masses on Phyllophora. CERATOCOLAX. B.
4. Not as above. 5.
5. Irregularly-lobed swellings on Ahnfeldtia. STERROCOLAX. A. P.
5. Not irregularly lobed. 6.
6. Erect polysiphonous branches bearing cystocarps and antheridia. COLACODASYA. P.
6. Frond solid, even or slightly lobed. 7.
7. External plant consisting chiefly of seriate tetraspores (nemathecia); no other fruit known. On Phyllophora and Gymnogongrus. ACTINOCOCCUS. A. P.
7. Sexual and other fruit of normal form; no nemathecia. 8.
8. Cystocarp as in Rhodomelaceae; on Laurencia. JANCZEWSKIA. P.
8. Cystocarp as in Sphaerococcaceae; on Gracilaria. GRACILARIOPSIS. P.
8. Cystocarp as in Gelidiaceae. 9.
9. Cystocarps few on each individual, with shallow interior; on Rhodomela. HARVEYELLA. AN.
9. Cystocarps many on each individual, with deep interior; on Polysiphonia. CHOREOCOLAX. AN.
10. Filiform; cylindrical, moniliform, or slightly compressed. 11.
10. Otherwise. 117.
11. Unbranched. 12.
11. Branched. 13.
12. Principally monisiphonous; color bright red; monospores formed in small oblique cells cut off from vegetative cells. ERYTHROTRICHIA. A. P.
12. Principally polysiphonous; color purplish; monospores formed in ordinary vegetative cells. BANGIA. A. P.

13. Branches attached to each other to form a loose, open network. HALODICTYON. As.
13. Otherwise. 14.
14. Frond solid, dense, a few cm. high, simple or 1-3 times forked. CORYNOMORPHA. As.
14. Branching more fully developed. 15.
15. Fresh water. 16.
15. Marine. 20.
16. Main axis distinctly articulate, except in oldest parts. 17.
16. Body of frond not distinctly articulate. 18.
17. Main axis of a single series of large cells, later developing a cortex of 1-4 layers of minute cells; slender, much branched; not gelatinous. COMPSOPOGON.
17. Main axis of a single series of cells, at first naked, later with rhizoidal coating; gelatinous. BATRACHOSPERMUM.
18. Gelatinous; axis of very slender, interwoven filaments, surrounded by a dense coating of long, articulate hairs. THOREA.
18. Not gelatinous; no hairs. 19.
19. Elongate, tubular, slender, more or less branched, with firm, cellular wall and slender central axis; usually with regular, torulose swellings. LEMANEA.
19. Short, nearly solid, densely branched, with irregular swellings. TUOMEYA.
20. Primary cells without cortication or other secondary growth, except sometimes by descending rhizoids on older parts. 21.
20. Secondary growth manifest. 35.
21. Frond with wide gelatinous sheath; pseudo-branching only. 22.
21. Less gelatinous; true branching present. 23.
22. Cells uniseriate, usually longer than broad; reproduction by akinetes. ASTEROCYTIS. A.
22. Cells often pluriseriate, usually shorter than broad; no akinetes. GONIOTRICHUM. A. P.
23. Minute filaments penetrating shells. CONCHOCELIS. A. P.
23. Not inhabiting shells. 24.
24. Erect filaments arising from creeping filaments attached by rhizoids with expanded ends. 25.
24. Basal filaments wanting, or less definite and without the special rhizoids. 28.
25. Asexual fruit 4-parted (tetraspores) 26.
25. Asexual fruit many parted (polyspores); cystocarp with wide gelatinous wall. SPERMOTHAMNION. A. P.
26. Main axis prostrate; glandular cells frequent. ANTITHAMNION, PP. A.
26. Main axis erect; no glandular cells. 27.
27. Branching very regularly pinnate; tetraspores tripartite, seriate in place of ultimate ramuli. GYMNOTHAMNION BIPINNATUM. As.

27. Branching irregular or obscurely pinnate; tetraspores cruciate, scattered or corymbosely aggregated. RHODOCHORTON. A. P.
28. Tetraspores cruciate; branching mostly opposite. ANTITHAMNION, PP. A. P.
28. Asexual fruit not cruciate. 29.
29. Asexual fruit mostly undivided (monospores), rarely bispores or tetraspores. 30.
29. Asexual fruit 4-many parted. 32.
30. Monospores in series, developed from cells of ultimate ramuli. SEIROSPORA. A.
30. Monospores solitary or clustered, not seriate. 31.
31. Minute epiphytes or on bryozoans etc., rarely 1 cm. high. ACROCHAETIUM. A. P.
31. Larger; few to many cm. high. MONOSPORA. AS.
32. Asexual fruit many-parted. PLEONOSPORIUM. A. P.
32. Asexual fruit 4-parted. 33.
33. Numerous short branches and descending rhizoidal filaments making a spongy coating about main axis. SPONGOCLONIUM. AS.
33. Branches free, rhizoidal growth limited; no spongy coating. 34.
34. Tetraspores seriate on ramuli. CALLITHAMNION. A. P.
34. Tetraspores whorled at nodes. GRIFFITHSIA. A. P.
35. Filaments of a single series of cells, showing plainly throughout or concealed by cortication or by short radial limited branches whose apices form a continuous surface. 36.
35. Monosiphonous axis distinguishable only in the earliest stages or not at all. 74.
36. Cells of monosiphonous axis surrounded by cells of the same length (pericentral cells) with or without cortication. 37.
36. No regular pericentral cells. 55.
37. Pericentral cells 3. FALKENBERGIA. AS.
37. Pericentral cells 4 or more. 38.
38. Main axis polysiphonous; ramuli wholly or in part monosiphonous. 39.
38. Polysiphonous throughout. 41.
39. Stichidia flat, tetraspores in 2 series. TAENIOMA. AS. PS.
39. Stichidia not flattened; tetraspores whorled. 40.
40. Radially branched; pericentral cells 4, not dividing by cross walls. MURRAYELLA. AS.
40. Dorsiventral; branching more or less distichous; pericentral cells dividing by cross walls. BOSTRYCHIA. A.
41. Erect axis arising from creeping basal filaments. 42.
41. No creeping filaments. 47.
42. Tetrasporangia 2 in each fertile segment. OPHIDOCLADUS. PS.
42. Tetrasporangia single in each segment. 43.
43. Branches in pairs, one limited opposite to one unlimited. DIPTEROSIPHONIA. AS.

43. Branching various, but not as above. 44.
44. Lateral branch from every fourth cell of the prostrate axis. HERPOSIPHONIA. AS.
44. Lateral branching at irregular intervals. 45.
45. Prostrate filament not sharply distinct from erect axis; apices not hooked. 46.
45. Prostrate filament more sharply distinct from erect axis; apices hooked or circinate. LOPHOSIPHONIA. AS. PS.
46. Ramuli of 2 kinds, unlimited and limited; the latter usually forming a dense coating to the branches from which they arise. BRYOCLADIA. AS. PS.
46. No distinct limited branches. POLYSIPHONIA, PP. A. P.
47. Sympodial. 48.
47. Monopodial. 50.
48. Tetraspores not covered by outer cells of stichidia. 49.
48. Dorsiventral; tetraspores covered by outer cells. HETEROSIPHONIA. AS.
49. Cystocarps external, pedicellate. DASYA. A. P.
49. Cystocarps immersed. POGONOPHORA. PS.
50. Branching distichous. PTEROSIPHONIA, PP. P.
50. Branching radial. 51.
51. Frond beset with colored hairs. 52.
51. Without colored hairs. 54.
52. Colored hairs persistent. 53.
52. Colored hairs deciduous, replaced by soft spines. WRIGHTIELLA. AS.
53. Stichidium with monosiphonous base. LOPHOCLADIA. AS.
53. Stichidium with polysiphonous base. BRONGNIARTELLA. AS.
54. Ecorticate, little branched; tetrasporangia 2 in a segment in longitudinal parallel lines in the stichidium. PACHYCHAETA. AS.
54. Corticate or ecorticate, usually much branched; tetrasporangia one in a segment in little modified branches. POLYSIPHONIA, PP. A. P.
55. Cortication of small cells arising at nodes, sometimes spreading to cover more or less completely the axis. 56.
55. Cortication varying, but not as above. 59.
56. Main axis and unlimited branches densely corticated; limited branches ecorticate or corticated at nodes only; apices usually with one or more colorless spines. SPYRIDIA. A. P.
56. No distinction of limited and unlimited branches. 57.
57. Minute, creeping; tetrasporangia relatively large, solitary at nodes; cortication at node of filament and around sporangium only; tips of branches not forcipate.
57. Varying much in size, creeping or erect, cortication sometimes covering the whole frond; sporangia usually whorled. 58.

58. Branching distichous; cortex subparenchymatous; apices in mature plant not forcipate. MICROCLADIA. P.
58. Branching not distichous; apices usually forcipate. CERAMIUM. A. P.
59. Central axis surrounded, at least in later stages, by secondary longitudinal filaments. DUDRESNAYA. AS. PS.
59. Central articulated filament without surrounding longitudinal filaments, or with only slight rhizoidal growth. 60.
60. Limited branches of axis closely set, forming a continuous surface to the frond. 61.
60. Limited branches of axis more or less closely set, but not so as to form a continuous surface. 68.
61. Tetraspores zonate; frond spinous. ENDOCLADIA. P.
61. Tetraspores cruciate or not known; frond not spinous. 62.
62. Branching more or less distichous. 63.
62. Branching radial. 66.
63. Cystocarps pedicelled; plant slender and delicate, often with hooked branches. BONNEMAISONIA. P.
63. Cystocarps not pedicelled. 64.
64. Cystocarps relatively large, prominent on both sides of the frond. 65.
64. Cystocarps smaller, inconspicuous. CRYPTOSIPHONIA. P.
65. Numerous fine rhizoidal filaments among the subcortical cells. GELIDIUM. A. P.
65. No such rhizoidal filaments. GELIDIOPSIS. AS.
66. Internal branches from central axis whorled. 67.
66. Internal branches alternate or opposite. GLOIOPELTIS. P.
67. Cystocarps large, pushing up the external layer as rounded prominences. GLOIOSIPHONIA. A. P.
67. Cystocarps small, not manifest externally. CALOSIPHONIA. AS.
68. Branching of frond more or less distinctly distichous. 69.
68. Branching radial. 72.
69. Limited branches whorled. WRANGELIA. AS.
69. Limited branches not whorled. 70.
70. Beset with fine monosiphonous hairs with polysiphonous persistent bases. DASYOPSIS. P.
70. Without monosiphonous hairs. 71.
71. Articulate axis entirely covered by cortication. PLUMARIA (PTILOTA). A. P.
71. Articulate axis naked in younger parts. GYMNOTHAMNION, PP. (PLUMARIA) A.
72. Limited branches alternate. NACCARIA. AS.
72. Limited branches whorled. 73.
73. Whorls distant. SPHONDYLOTHAMNION. AS.
73. Whorls close, often contiguous. CROUANIA. AS. PS.

74. Center of frond occupied by a strand of filaments with radial branches whose apices form the surface. 75.
74. Central strand wanting, or when present surrounded by a cellular growth, not distinctly filamentous. 84.
75. Central strand of two twisted filaments. OCHTODES. AS.
75. Central strand of many filaments. 76.
76. More or less calcareous. 77.
76. Not normally calcareous. 79.
77. Definite cortex formed at the apices of the branches from the central strand. GALAXAURA. AS. PS.
77. No definite cortex; apices free or loosely united. 78.
78. Cystocarp depressed, with involucre. LIAGORA, PP. AS. PS.
78. Cystocarp subspherical, without involucre. TRICHOGLOEA, PP. AS.
79. Peripheral filaments of long, slender cells; cystocarp loose, of slender sporogenous filaments. TRICHOGLOEA HERVEYI. AS.
79. Peripheral filaments less slender; spores larger and more densely packed. 80.
80. Ramuli recurved and pectinate. LIAGORA PECTINATA. AS.
80. Ramuli not recurved and pectinate. 81.
81. Cystocarps not distinctly limited, the carpogonial branches mingling with the cortical filaments; main axis densely beset with short, slender, patent ramuli. CUMAGLOIA.* P.
81. Cystocarps limited; slender patent ramuli few or wanting. 82.
82. Carpogonia terminal on younger branches of cortical filaments. NEMALION. A. P.
82. Carpogonial branches arising laterally from cells of cortical filaments. 83.
83. Soft and loose tissued; end cell of peripheral filament subspherical, larger than lower cells. HELMINTHOCLADIA. AS. PS.
83. Firmer; end cell not noticeably larger. HELMINTHORA. PS.
84. Branching dichotomous. 85.
84. Branching not dichotomous. 90.
85. Substance firm, color dark. POLYIDES. AN.
85. Substance soft, color lighter. 86.
86. Forkings very close, divisions obovoid to cylindrical. COELARTHRUM. AS.
86. Divisions cylindrical or subdistantly moniliform. 87.
87. Cystocarps small, immersed, without definite cellular pericarp. HALYMENIA AGARDHII. AS.
87. Cystocarps immersed or prominent, with cellular pericarp. 88.
88. External layer of large, colorless cells (utricles) outside of smaller-celled proper cortex. 89.

*Setchell & Gardner, Univ. Calif. Publ. Bot., Vol. VI, p. 398, 1917.

88. External layer of small cells; utricles submerged or inconspicuous. GYMNOPHLOEA. AS. P.
89. Sporogenous filaments arising in a single tuft from bottom of cystocarp. SCINAIA. A. P.
89. Sporogenous filaments arising from several points in wall of cystocarp. PSEUDOSCINAIA. P.
90. Stem terete, cellular, bearing vesicular, pyriform branches. CHRYSYMENIA, PP. AS. P.
90. No such sharp distinction between stem and branches. 91.
91. Branches constricted at frequent intervals. 92.
91. Branches constricted at base or not at all. 94.
92. Constrictions throughout frond. 93.
92. Constrictions in smaller branches only. GASTROCLONIUM. P.
93. Branching proliferous; small prostrate plant. CATENELLA. AS.
93. Branching alternate; larger erect plant. CHAMPIA. A.
94. Frond soon becoming hollow. 95.
94. Frond becoming hollow at a late stage if ever. 97.
95. Substance tough and harsh; interior of roundish angular cells. HALOSACCION, PP. AN. PN.
95. Substance softer; elongate filaments more or less abundant in the interior. 96.
96. Ultimate divisions of filaments moniliform, forming the cortex. DUMONTIA. AN. PN.
96. A few fine filaments in the interior, otherwise of roundish angular cells, larger towards the cavity, smaller towards the surface. LOMENTARIA. A.
97. Branches ending in fine feathery tufts; frond arising from a stout creeping filament. ASPARAGOPSIS. AS.
97. Not as above. 98.
98. Stiff and wiry. AHNFELDTIA. AN. PN.
98. Not stiff and wiry. 99.
99. Frond irregularly branched. 100.
99. Branching more or less regularly alternate or opposite. 105.
100. Tetraspores cruciate. 101.
100. Tetraspores zonate. 103.
101. Tetraspores in swollen ends of branches. CORDYLECLADIA. AS. PS.
101. Tetraspores in cortex throughout frond. 102.
102. Median layer of longitudinal filaments; tetraspores scattered. PRIONITIS, PP. P.
102. No median layer of longitudinal filaments; tetraspores in sori. GIGARTINA, PP. A. P.
103. Slender, filiform, smooth. 104.
103. Stout, spinous. EUCHEUMA, PP. AS.
104. Of uniform diameter or nearly so; branches little or not at all constricted at base; apices blunt. WURDEMANNIA. AS.

104. Gradually tapering to very slender, often circinate apices; branches constricted at base. MYCHODEA. PS.
105. Ultimate ramuli differing in size or shape from branches of earlier orders. 106.
105. Ultimate ramuli little specialized. 109.
106. Ramuli spinous. ACANTHOPHORA. AS.
106. Ramuli not spinous. 107.
107. Ramuli short-cylindric or clavate; point of growth in a terminal pit. LAURENCIA. AS. P.
107. Point of growth not sunken. 108.
108. Substance soft; ramuli lanceolate to clavate. CHONDRIA. A. P.
108. Substance of main frond hard; ramuli filiform. DIGENIA. AS.
109. Cross section showing roundish-angular cells, with or without a thin coating of moniliform filaments. 110.
109. Section showing a strand of longitudinal filaments. 114.
110. Cystocarps external, pedicellate; tetrasporangia in a double series in the little changed ramuli. 111.
110. Cystocarps more or less immersed, not pedicellate; tetrasporangia not in a double series. 112.
111. Branching radial. RHODOMELA. AN. P.
111. Branching distichous. ODONTHALIA FLOCCOSA. PN.
112. Cystocarps and tetraspores in swollen ultimate ramuli; tips of branches often hooked or circinate. HYPNEA. A. P.
112. Cystocarps laterally prominent on main divisions of frond. 113.
113. Substance firm, cartilaginous; branches seldom slender or acute. GYMNOGONGRUS, PP. A. P.
113. Substance softer, branches often slender and acute. GRACILARIA, PP. A. P.
114. Cystocarps forming swellings in the branches, prominent all around. CYSTOCLONIUM. A. P.
114. Cystocarps laterally prominent. 115.
115. Cystocarps in short, more or less specialized branches. SOLIERIA. AS.
115. Cystocarps throughout the frond. 116.
116. Lesser branches usually slender and elongate, moderately constricted at base; cross section showing chiefly roundish-angular cells, with a small firm central strand of elongated filaments. AGARDHIELLA. A. P.
116. Lesser branches usually stout and short; all branches tapering to base and apex; section showing a few rows of roundish-angular cells about a wide central portion containing a few distant filaments. RHABDONIA. AS.
117. Not calcareous. 118.
117. Calcareous. 187.
118. Frond a simple, rarely proliferous, sac. 119.
118. Frond not saccate. 120.

119. Large, coarse, usually saxicolous. HALOSACCION, pp. P.
119. Small, soft, epiphytic on Laurencia. RICARDIA. P.
120. Frond not horizontally expanded and adherent. 121.
120. Frond a flat, more or less adherent expansion. 176.
121. Frond with axial filament and pericentral cells, with or without cortication. 122.
121. No definite pericentral cells. 129.
122. Branches free. 123.
122. Branches united to a network of regular form. 128.
123. Articulations distinct, at least in the younger parts. 124.
123. Articulations concealed by cortication. 125.
124. Frond flat, membranaceous, the polysiphonous axis flanked by a membrane 2 cells thick. AMANSIA. AS.
124. Frond flattened more or less, but with no lateral membrane. PTEROSIPHONIA, pp. P.
125. Polysiphonous axis flanked by a membrane, both strongly corticated. 126.
125. Cortication more or less developed, but no membranous wing. 127.
126. Marginal teeth alternate. VIDALIA. AS.
126. Marginal teeth opposite. ENANTIOCLADIA. AS.
127. Narrow, branching irregular, beset with 2 or 3 rows of spinous ramuli. BRYOTHAMNION. AS.
127. Flat, wide or narrow, distichously pinnate, not spiny. ODONTHALIA, pp. AN. PN.
128. Slender, smooth, much branched, substance compact. THURETIA. AS.
128. Stouter, less branched, showing a loose open network. DICTYURUS. AS.
129. Frond in whole or part a definite network of small filaments. 130.
129. No definite network. 131.
130. Whole frond a fine, felt-like network. HALOPLEGMA. AS.
130. Membranaceous below, with one or two zones of regular network in the upper part. MARTENSIA. AS.
131. Membranaceous, of one to several layers of squarish cells. 132.
131. Not membranaceous, or if so, of other structure than as above. 137.
132. Frond with midrib. 133.
132. Frond without midrib. 135.
133. Frond of small oval or linear segments, prostrate, rooting at the nodes. CALOGLOSSA. A.
133. Larger, erect. 134.
134. Frond ovate to lanceolate, usually undivided; sori of tetraspores somewhat verrucose, prominent. GRINNELLIA. A.
134. Frond wide or narrow, laciniate or subdichotomous, often proliferous; sori immersed or slightly and evenly prominent. DELESSERIA. A. P.

135. Reproductive bodies formed in practically unchanged vegetative cells, never external. 136.
135. Antheridia superficial; cystocarps prominent; tetraspores in indefinite sori. NITOPHYLLUM. As. P.
136. Frond arising from a parenchymatous mass, at first saccate, later splitting and monostromatic; monospores formed from portion of vegetative cell. PORPHYROPSIS. An.
136. Frond mono- or distromatic, never saccate; reproducing by antheridia and carpospores, and by monospores formed from the entire vegetative cell. PORPHYRA. A. P.
137. Frond much and finely divided, beset with long, slender ramelli. 138.
137. Divisions less fine and soft. 139.
138. Very gelatinous; not manifestly pinnate. SARCOMENIA. As.
138. Not so gelatinous; main divisions little divided, with dense marginal fringe. BAYLESIA. P.
139. Orbiculate frond umbilicate or perforate by main stem. CONSTANTINEA. P.
139. Frond not umbilicate nor perforate by stem. 140.
140. Frond with filiform or flattened stipe and expanded lamina. PHYLLOPHORA. A. P.
140. No sharp differentiation of stipe and lamina. 141.
141. Frond originally a lanceolate or lance-ovate leaf, with broad midrib, the membrane often splitting into similar leaflets; tetraspores tripartite. ERYTHROPHYLLUM. P.
141. Otherwise. 142.
142. Frond narrow throughout, repeatedly pinnately branched. 143.
142. Otherwise. 147.
143. Articulate axial filament present. 144.
143. No articulate axial filament. 146.
144. Branching distinctly pinnate, margin subentire. 145.
144. Branching less regular, margin jagged-toothed. LEPTOCLADIA. P.
145. Axial filament with stout whorled branches. PIKEA. P.
145. Axis slender, with slender rhizoidal branches. FARLOWIA. P.
146. Substance firm; many fine descending rhizoidal filaments among subcortical cells. GELIDIUM, pp. A. P.
146. Substance soft; rhizoidal filaments absent or insignificant. GRATELOUPIA, pp. A. P.
147. Interior of frond of roundish cells, showing little or no filamentous arrangement; tetraspores cruciate. 148.
147. Interior of frond showing a more or less filamentous arrangement. 153.
148. Open passages among cells of inner layer; cystocarps usually large. CALLOPHYLLIS. As. P.
148. Cells of inner layer without interstices. 149.

149. Substance soft and delicate, frond often becoming hollow.
CHRYSYMENIA, PP. AS. P.
149. Substance firmer, frond not becoming hollow. 150.
150. Tetraspores in definite sori. 151.
150. Tetraspores scattered. 152.
151. Network of arachnoid filaments about spores in cystocarp.
FAUCHEA. P.
151. No network in cystocarp; cystocarp unknown in commonest species, rare in others. RHODYMENIA. A. P.
152. Substance soft, frond broadly expanded, membranaceous.
AGARDHINULA. AS.
152. Substance firmer; frond of variable form, rarely expanded and membranaceous. GRACILARIA, PP. A. P.
153. Frond narrow, much branched, distichous; secund series of 2-4 pinnules alternating on rachis. PLOCAMIUM. P.
153. Not with pinnules in alternate secund series. 154.
154. Frond gelatinous and loose-tissued, rather irregularly divided.
PLATOMA. A.
154. Otherwise. 155.
155. Frond membranaceous, smooth or roughened with proliferations. 165.
155. Frond fleshy or cartilaginous, not membranaceous. 156.
156. Substance soft, entirely of articulate filaments; tetraspores in prominent subspherical clusters resembling cystocarps.
IRIDAEA. P.
156. Substance firmer; tetraspores scattered. 157.
157. Frond expanded, subfoliaceous. 158.
157. Less expanded, not foliaceous. 160.
158. Frond with thickened margin and frequent papillae.
GIGARTINA, PP. P.
158. Margin not distinctly thickened; papillae few. 159.
159. Original frond splitting into somewhat cuneate laciniae.
SARCOPHYLLIS. P.
159. Frond subpinnately proliferous. GRATELOUPIA, PP. AS. P.
160. Axial layer of longitudinal filaments, surrounded by a layer of roundish-angular cells; frond usually rough and spiny.
EUCHEUMA, PP. AS.
160. No such two distinct layers. 161.
161. Frond widely expanded, irregularly proliferous; interior showing stout branching filaments imbedded in much smaller rhizoidal filaments. WHIDBEYELLA. PN.
161. Frond more or less regularly branched, not widely expanded. 162.
162. Lesser divisions pinnate, the ultimate divisions fertile.
PRIONITIS, PP. P.
162. Fronds dichotomous. 163.

163. Little or no filamentous structure perceptible.
GYMNOGONGRUS, pp. A. P.
163. Interior distinctly filamentous. 164.
164. Fruit formed in special leaflets. POLYOPES. PS.
164. Fruit generally distributed. CHONDRUS. AN. P.
165. Frond orbicular, with or without similar proliferations; interior of stout and slender filaments mixed; lower part of frond showing more or less distinct superficial net-like corrugations.
WEEKSIA. P.
165. Otherwise. 166.
166. Tetraspores zonate. 167.
166. Tetraspores cruciate. 171.
167. Margins with spiny, ciliiform or tubercular proliferations. 168.
167. Margins normally free from proliferations. 169.
168. Fronds large, with few and irregular divisions, the surface mostly rough and tubercular. MERISTOTHECA. AS.
168. Fronds smaller, many times dichotomously divided into linear or cuneate divisions, margins densely ciliate, surface smooth or nearly so. RHODOPHYLLIS. AN.
169. Frond broadly expanded, simple or irregularly lobed.
TURNERELLA. B.
169. Frond repeatedly and more regularly divided. 170.
170. Frond a few times regularly forked; color dark.
ANATHECA. P.
170. Frond narrow, much branched dichotomously or subpinnately; color lighter. EUTHORA. AN. PN.
171. Fructification more or less definitely located. 172.
171. Fructification generally distributed. 173.
172. Cystocarps in a median line on the linear divisions of the dichotomous frond; tetraspores in nemathecia.
STENOGRAMMA. P.
172. Cystocarps in marginal leaflets; tetraspores in sori in leaflets or at tips of segments. CRYPTONEMIA. AS. P.
173. Frond large, often laciniate, but not regularly divided; cystocarps in sori. AEODES. P.
173. Cystocarps solitary, but often abundant. 174.
174. Frond beset, often very densely, with blunt or spinous papillae; margin usually thickened. GIGARTINA, pp. A. P.
174. Frond without papillae or thickened margin. 175.
175. Frond usually rather firm. KALLYMENIA. A. P.
175. Frond usually softer and more gelatinous. HALYMENIA, pp. AS.
176. Not calcareous. 177.
176. Calcareous. 187.
177. Frond an attached expansion of radial filaments, without erect growth. ERYTHROCLADIA. A.
177. Erect growth from prostrate frond. 178.

178. Prostrate frond bearing only tetraspores and paraphyses.
RHODODERMIS, pp. A. P.
178. Prostrate layer bearing closely packed erect filaments. 179.
179. Erect filaments adherent. 180.
179. Erect filaments only loosely attached. 185.
180. Tetraspores external to the vegetative frond. 181.
180. Tetraspores below surface of vegetative frond. 184.
181. Tetraspores without paraphyses. CONTARINIA. AS.
181. Tetraspores with paraphyses. 182.
182. Vertical filaments both above and below a median layer of radial filaments. CORIOPHYLLUM.* P.
182. Vertical filaments above horizontal layer only. 183.
183. Frond closely adherent by whole under surface.
RHODODERMIS, pp. A. P.
183. Frond attached by rhizoids, margin usually free.
PEYSONNELLIA, pp. A. P.
184. Tetraspores in sunken conceptacles. HILDENBRANDTIA. A. P.
184. Tetraspores among erect filaments. PEYSONNELLIOPSIS. P.
185. Tetraspores solitary or seriate, intercalary in erect filaments.
PETROCELIS. A. P.
185. Tetraspores lateral on erect filaments. 186.
186. Tetraspores zonate. CRUORIELLA. AS.
186. Tetraspores cruciate, often irregularly. PLAGIOSPORA. AN.
187. Frond inarticulate. 188.
187. Frond articulate. 197.
188. Attached by rhizoids; fructification not in conceptacles.
PEYSONNELLIA, pp. A. P.
188. No rhizoids; all kinds of fruit in conceptacles. 189.
189. Tetrasporic conceptacle with several pores. 190.
189. Tetrasporic conceptacle with a single pore. 192.
190. Vegetative frond monostromatic. EPILITHON.
190. Vegetative frond pleiostromatic. 191.
191. Tetrasporic conceptacles prominent, with flattened or rounded top.
LITHOTHAMNIUM.
191. Tetrasporic conceptacles immersed, with concave top.
PHYMATOLITHON.
192. Vegetative frond monostromatic. 193.
192. Vegetative frond pleiostromatic; of hypothallium and perithallium. 194.
193. Special hair-bearing cells (heterocysts) among vegetative cells.
MELOBESIA.
193. No specialized cells. HETERODERMA.
194. Tetrasporangia uniformly distributed over bottom of conceptacle. GONIOLITHON.

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*Gardner, Univ. Calif. Publ. Bot., Vol. VI, p. 396, 1917.

194. Paraphyses in middle of conceptacle, surrounded by tetrasporangia. 195.
195. Hypothallium monostromatic. DERMATOLITHON.
195. Hypothallium pleiostromatic. 196.
196. Cells all of approximately the same size. LITHOPHYLLUM.
196. Large rounded cells single or in groups among other cells. POROLITHON.*
197. No uncalcified connections between the joints. LITHOTHRIX. P.
197. Uncalcified connections between the joints. 198.
198. Conceptacles sessile on the surface of the joints. AMPHIROA. AS. P.
198. Conceptacles stipitate. 199.
199. Branching pinnate. CORALLINA. A. P.
199. Branching dichotomous. JANIA. AS. P.

*Our knowledge of the distribution of the inarticulate corallines is not sufficient to be worth recording.

GLOSSARY.

Acicular. Needle-shape.
Aerial. Living in the air; as regards algae, merely indicating a non-aquatic habitat.
Akinete. A motionless asexual spore.
Alternate. Not opposite nor secund on the axis.
Amorphous. Of no definite form or structure.
Annulate, annular. Ring-shape or showing rings.
Antheridium (pl. antheridia). The male reproductive organ.
Apex. The end opposite the attached end or base.
Apical. At or referring to the apex.
Aquatic. Living in the water.
Arachnoid. Very finely filamentous, like a cobweb.
Articulate. Jointed.
Asexual. Without sex.
Attenuate. Diminishing, slenderly tapering.
Axil. The angle formed by a leaf or branch with the stem.
Axillary. Borne in an axil.

Basal. At or referring to the base.
Bicellular. Consisting of two cells.
Bispore. A non-sexual spore, formed two from a mother cell.
Bullate. Swollen, blistered.
Bullation. An inflated or blister-like swelling.

Calcareous. Consisting of lime.
Calcified. Coated or permeated with lime.
Canaliculate. Longitudinally channelled.
Carpogonial (branches). Those producing the carpogonium.
Carpogonium. The female organ of the red algae.
Carpospore. The sexual spore of red algae.
Chromatophore. A specialized, color-bearing protoplasmic body.
Ciliate. Furnished with one or more cilia.
Ciliiform. Resembling a cilium.
Cilium (pl. cilia). A hair, usually motile.
Circinnate. Curled downwards from the apex.
Clathrate. Net-like.
Clavate. Club-shape.
Colony. A united group of several or many cells, usually of definite outline.
Concentric. Having the same center.
Conceptacle. A cavity in the frond, usually containing reproductive cells.
Conical. In the shape of a cone.
Constricted. Narrowed sharply at one or more places.
Continuous. Without interruption.
Cordate. Heart-shape, the point upwards or outwards.

Coronula. A circle of pointed cells or bicellular filaments on the summit of the sporangium; in the Characeae.
Corrugated. Wrinkled or in folds.
Cortex. A superficial layer of tissue, corresponding to the bark in higher plants.
Cortical. External (of layers of tissue).
Corticate. Having a cortex.
Cortication. See cortex.
Corymbose. In the form of a flat-topped cluster.
Cruciate. Divided by two planes at right angles (of tetraspores).
Cryptostoma (pl. cryptostomata). A cavity in the tissue of the frond, containing hairs.
Cuneate. Wedge-shape, the point downward.
Cystocarp. The mature sexual fruit of red algae.

Deciduous. Falling away; not persistent.
Diaphragm. A membrane traversing the cavity of a frond.
Dichotomous. Dividing into two similar divisions.
Differentiated. Having developed a diversity of structure or function.
Diffluent. Readily dissolving.
Digitate. Divergent from a common point, like the fingers of a hand.
Dioecious. With the organs of the two sexes on distinct individuals.
Discoid. In the form of a disk.
Distichous. Arranged in two rows or ranks.
Distromatic. Of two layers of cells.
Divaricate. Widely divergent.
Dorsiventral. With distinction of back and front or upper and lower surfaces or sides.

Ecorticate. Without cortex.
Ellipsoid. Showing an elliptical section (of solids).
Elongate. Stretched out; long.
Embryonal. Rudimentary.
Endophytic. Inhabiting the interior of some plant.
Endozoic. Inhabiting the interior of an animal.
Entire. Without divisions, lobes or teeth.
Epidermal (layer). External; superficial.
Epiphyte. A plant growing on another plant.
Evanescent. Quickly disappearing.
Excentric. Not situated at the center; not symmetrical about a center.

Family. A united group of several or many cells, usually without definite outline.
Filament. A slender, cylindrical or subcylindrical form of frond, usually of a single series of cells.
Filiform. Thread-like.
Foliaceous. Leaf-like.

LIBRARY

Forcipate. Forked and incurved, like pincers.
Frond. The entire vegetative structure of an alga; usually with more specialization than a thallus.
Furcate. Forked.
Fusiform. Spindle-shape.

Gamete. A reproductive body requiring union with another such body before germination.
Geminate. Produced in pairs.
Genus. A group next above species, and containing one or more species.
Gland. A secreting structure, or any appendage or protuberance of similar appearance.
Glandular. Of the nature and appearance of a gland.
Gonidangium. A cell producing gonidia from its contents.
Gonidium (pl. gonidia). An asexual reproductive cell developed, usually in considerable number, in a gonidangium.

Hapteron (pl. haptera). A cellular basal organ of attachment, usually much branched.
Hemispherical. In the form of half a sphere.
Heterocyst. A specialized cell, usually paler than the vegetative cells; in Myxophyceae.
Homogeneous. Of uniform character or substance.
Host. An organism on which another organism is living.
Hyaline. Translucent or transparent.
Hypothallium. The lower, horizontal layer, in crustaceous algae.

Immersed. Situated below the surface.
Imperforate. Without perforations or openings.
Inarticulate. Not jointed.
Infundibuliform. Funnel-shape.
Intercalary. Occurring in the continuity of a filament; not terminal nor basal.
Involute. Rolled inward.

Labyrinthiform. With complicated sinuous lines or winding passages.
Laciniate. Cut into narrow lobes or segments.
Lamellate. Consisting of thin, distinct layers.
Lamina. A blade-like expansion.
Lanceolate. Longer than broad, tapering upward from below the middle.
Lateral. Situated at one side.
Lenticular. Lens-shape.
Limited. Incapable of growth beyond a certain fixed extent.
Linear. Long and narrow, with sides parallel.
Longitudinal. In the direction of the greatest dimension; in the line from base to apex.
Lunate. Half-moon or crescent-shape.

Membrane. A thin, pliable tissue.
Meridional. Passing from pole to pole on the surface of a sphere or spheroid.
Moniliform. With frequent constrictions, like a string of beads.
Monoecious. With organs of two sexes on the same individual.
Monopodial. Having a continuous axis from which lateral branches arise.
Monosiphonous. Of a single series of cells (of a filament).
Monospore. An asexual spore formed singly in a mother cell.
Monostromatic. Of a single layer of cells.
Motile. Capable of self motion.
Multinucleate. With more than one nucleus.

Nemathecium (pl. nemathecia). In red algae, a wart-shaped elevation containing many spores.

Obconical. In the form of an inverted cone.
Oblique. Unequal-sided or slanting.
Oogonium (pl. oogonia). The organ in which oospores are produced.
Oospore. A non-motile female cell.
Orbicular, orbiculate. Of approximately circular outline.
Ovate. In form of a longitudinal section of an egg.
Ovoid. Egg-shape, the small end outward.

Papilla. A short, nipple-like prominence.
Papilliform. In the form of a papilla.
Paraphysis (pl. paraphyses). A short sterile filament accompanying spores.
Parasite. Deriving its nourishment from other organisms.
Parenchyma Soft tissue of cells with unthickened walls.
Parietal. Borne on or approximate to the side walls.
Pedicel. The supporting stem of a sporangium or similar organ.
Penicillate. In the form of a brush-like tuft.
Perforate. Pierced with holes.
Pericarp. The wall of the cystocarp or other fruit vessel.
Pericentral. Surrounding a central filament or layer.
Peripheral. Belonging or referring to the surface or outline.
Perithallium. The upper layer of vertical filaments, in crustaceous algae.
Phylogeny. The theory of the ancestral origin of species, etc.
Pinnate. With leaflets or segments on each side of a common axis.
Pinnule. The secondary or ultimate division of an originally pinnate frond.
Pleiostromatic. Of several layers of cells.
Plicate. Folded or plaited.
Pluricellular. Of more than one cell.
Plurilocular. Containing more than one chamber or cavity.
Polyedron. A solid with many sides and angles.

Polygon. A figure with many sides.
Polysiphonous. Of more than one series of cells (of a filament).
Polyspore. A non-sexual spore, formed more than four in a mother cell.
Polystromatic. Of many layers of cells.
Pore. A small opening through a cell wall.
Pseudobranch. A branch formed by the breaking or looping of a trichome.
Procarp. The unicellular or few-celled female organ of red algae.
Process. An outgrowth or prolongation.
Proliferous. Producing outgrowth similar to the original.
Propagulum (pl. propagula). A differentiated, bud-like, detachable organ in brown algae.
Protoplasm. The fluid substance constituting a living cell.
Pulvinate. Cushion-shape.
Pyrenoid. A small body of denser and usually darker substance in the interior of a cell.
Pyriform. Pear-shape.

Rachis. The axis of a pinnate frond.
Radial. Arranged about and proceeding from a common axis or center.
Ramellus (pl. ramelli). A ramulus of the ultimate order.
Ramulus. A small branch or a branch of a higher order than the first.
Reniform. Kidney-shape.
Rhizoid. An organ similar to a root, but without the root-function of higher plants.
Rhizoidal. Having the character of a rhizoid.
Rudimentary. Having an imperfect or incomplete resemblance to some object.

Saccate. Sac- or pouch-shape.
Saxicolous. Growing on rocks or stones.
Secund. Seriate on one side of an axis.
Segment. One of several portions into which a thing is divided.
Semi-cell. In desmids, one of the two symmetrical parts, separated by an isthmus, forming the cell.
Seriate. In linear succession.
Seta. A bristle or stiff hair.
Sorus. A group or cluster (of spores).
Spherical. In the form of a sphere.
Spheroid. An elongated or depressed sphere.
Spheroidal. In the form of a spheroid.
Sporangium (pl. sporangia). A cell or cell-structure containing spores; of very different form in different genera.
Sporophyll. A secondary lamina bearing the fructification.
Stellate. Star-shape.
Stichidium (pl. stichidia). A pod-like structure in certain red algae, containing tetraspores.

Stipe. The stalk on which some organ is borne.
Stipitate. Borne on a stipe.
Stipular ring. A whorl of pointed cells or short filaments, about the base of a whorl of leaves or branches, in the Characeae.
Stratum. A layer.
Sub-. A prefix indicating a less degree of the character denoted by the word in composition with it.
Subcortical. Next under the cortex (of layers of tissue).
Subterranean. Below the surface of the ground.
Superficial. Referring or pertaining to the surface.
Symmetrical. Agreeing in form, number and position.
Sympodial. A system of growth whereby a branch assumes the direction of the axis and the latter becomes lateral and continues its growth in a lateral direction.
Synonym. A word with approximately the same meaning as another, but often with a shade of difference.

Taxonomy. The science of classification.
Terminal. Occupying the end or apex.
Tetrasporangium. A mother cell containing four non-sexual spores.
Tetraspore. A non-sexual spore, produced four in a mother cell.
Thallus. A plant body, usually of less differentiated character than a frond.
Torulose. With alternate swellings and constrictions; knotted.
Trapezoidal. Having two sides parallel, and only two.
Trichome. In blue-green algae, the series of connected cells, as distinguished from the filament, composed of trichome and sheath.
Trichothallic. That form of growth by which the growing point produces thallus cells below and hair cells above.
Tubercular. With irregular rounded superficial projections.

Umbilicate. Attached by the center (of a discoid surface).
Uncalcified. Not charged nor incrusted with lime.
Unicellular. Consisting of only one cell.
Uniform. Having one character throughout.
Unilateral. Occurring or developed on one side only.
Unilocular. Containing only a single chamber or cavity.
Uninucleate. With only one nucleus.
Unlimited. Capable of indefinite growth.
Utricle. The sac-like end of a filament or its portion.

Vacuole. A cavity with watery contents in the protoplasm of a cell.
Verrucose. Warty or wart-like.
Vertical. Upright.
Vesicle. A small bladder-like structure.
Vesicular. Bladdery.

Whorled. In a group of three or more around an axis and arising from the same level.

Zonate. Separated by three parallel planes (of tetraspores).

Zone. A circular ring or band.

Zoogamete. A motile spore, uniting with a similar spore before germination.

Zoospore. A motile spore.

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27. Frank S. Collins: The Green Algæ of North America (Supplementary Paper). 2 Plates.
28. F. D. Lambert: Didymosporangium repens, New Genus and Species of Chætophoraceæ. 1 Plate.
29. F. N. Blanchard: Two New Species of Stigonema (*Rhodora*, Vol. 15, pp. 192–200, Plate 105, November, 1913). 1 Plate.
30. H. V. Neal: The Morphology of the Eye-muscle Nerves (*Journal of Morphology*, Vol. 25, pp. 1–188, 9 Plates and 4 Text-figures, March. 1914). 9 Plates.
31. Alfred C. Lane: Mine Water Composition an Index to the Course of Ore Bearing Currents (*Economic Geology*, Vol. IX, No. 3. April, 1914).
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